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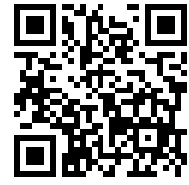

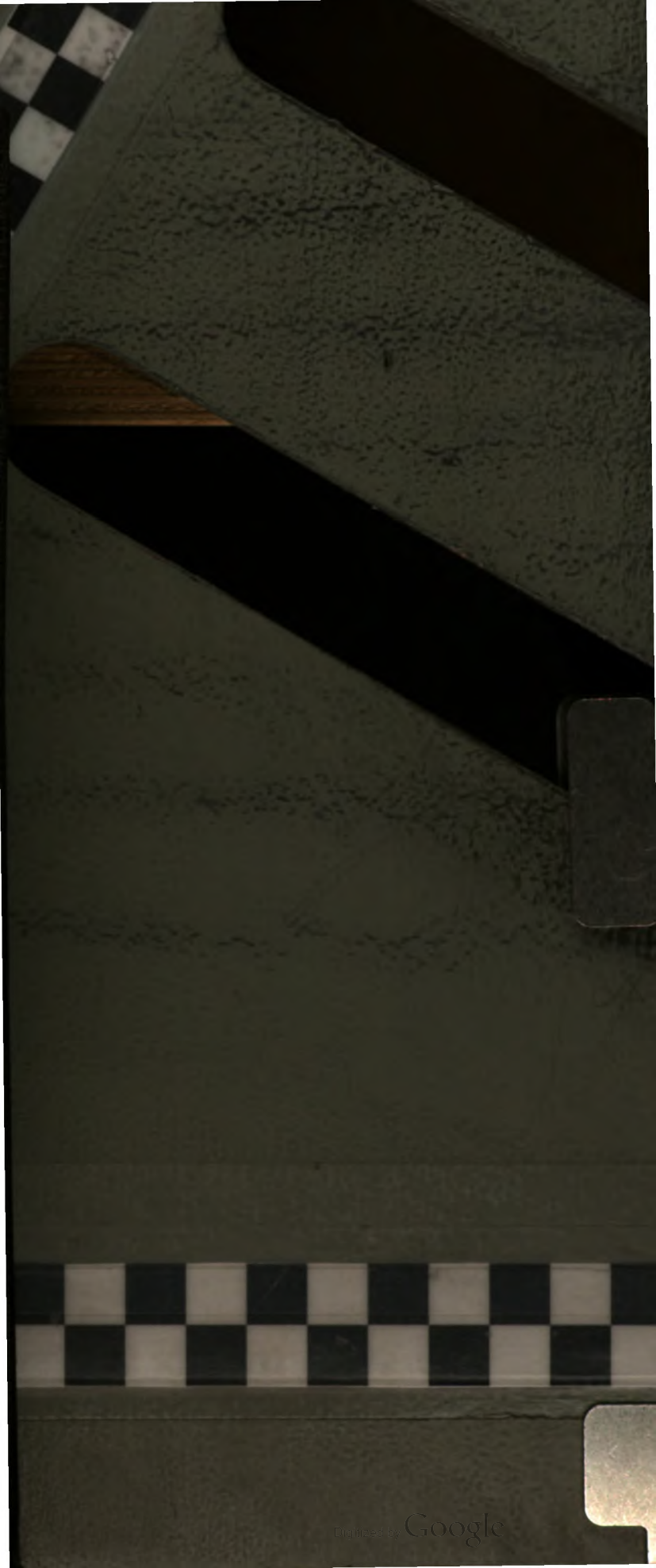
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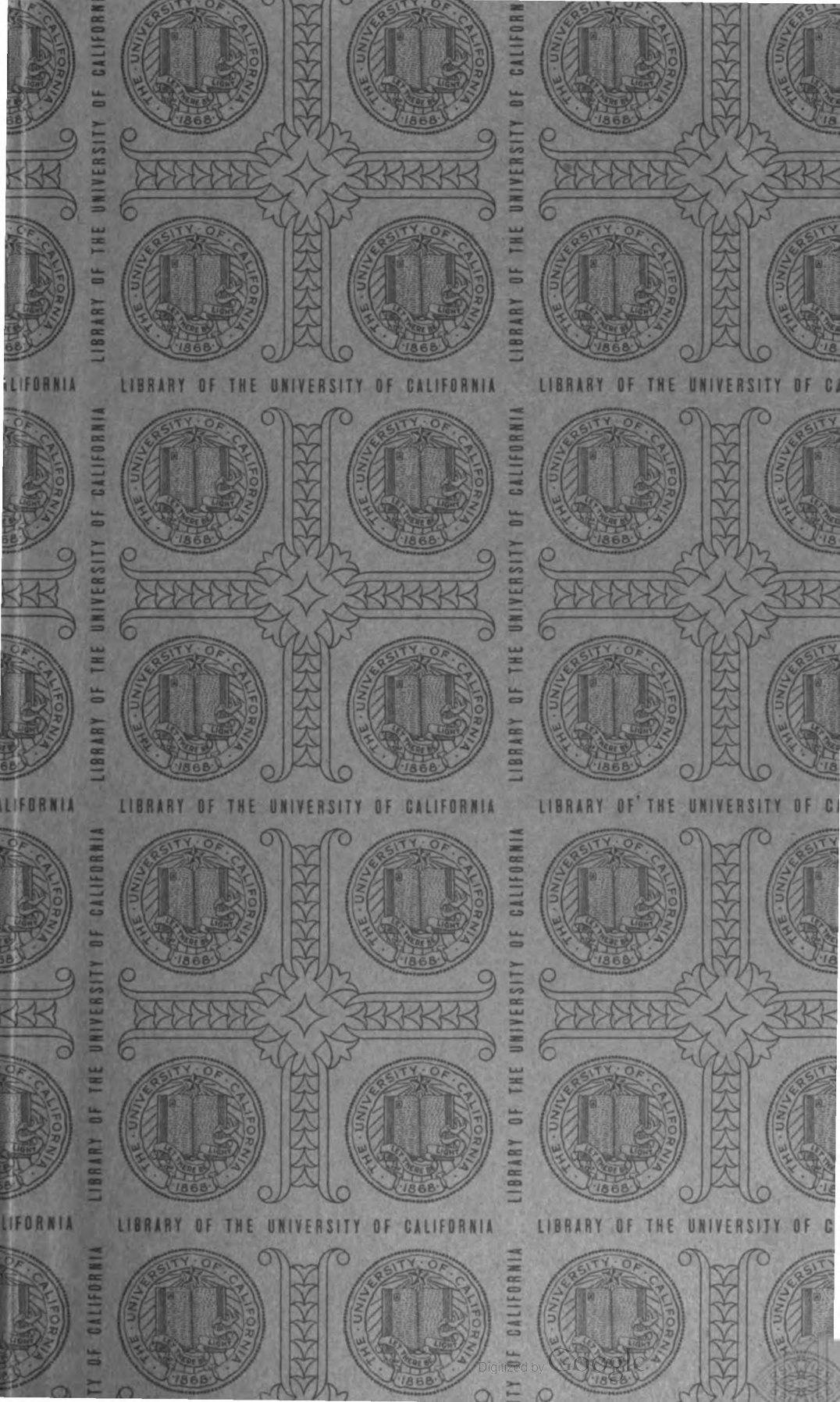

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THE JOURNAL

OF

MENTAL SCIENCE

(THE BRITISH JOURNAL OF PSYCHIATRY)

BY AUTHORITY OF
THE ROYAL MEDICO-PSYCHOLOGICAL ASSOCIATION

EDITOR-IN-CHIEF
G. W. T. H. FLEMING

CO-EDITORS
Alexander Walk and P. K. McCowan

AND WITH THE ASSISTANCE OF

E. D. Adrian	E. G. Holmes
F. C. Bartlett	C. J. McCarthy
S. M. Coleman	Alfred Meyer
C. J. C. Earl	Lionel S. Penrose
Sir A. Fleming	A. A. W. Petrie
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W. Stephenson

VOL. XCIV

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" In adopting our title of the *Journal of Mental Science, published by authority of the Medico-Psychological Association*, we profess that we cultivate in our pages mental science of a particular kind, namely, such mental science as appertains to medical men who are engaged in the treatment of the insane. But it has been objected that the term mental science is inapplicable, and that the term mental physiology or mental pathology, or psychology, or psychiatry (a term much affected by our German brethren), would have been more correct and appropriate; and that, moreover, we do not deal in mental science, which is properly the sphere of the aspiring metaphysical intellect. If mental science is strictly synonymous with metaphysics, these objections are certainly valid; for although we do not eschew metaphysical discussion, the aim of this JOURNAL is certainly bent upon more attainable objects than the pursuit of those recondite inquiries which have occupied the most ambitious intellects from the time of Plato to the present, with so much labour and so little result. But while we admit that metaphysics may be called one department of mental science, we maintain that mental physiology and mental pathology are also mental science under a different aspect. While metaphysics may be called speculative mental science, mental physiology and pathology, with their vast range of inquiry into insanity, education, crime, and all things which tend to preserve mental health, or to produce mental disease, are not less questions of mental science in its practical, that is in its sociological point of view. If it were not unjust to high mathematics to compare it in any way with abstruse metaphysics, it would illustrate our meaning to say that our practical mental science would fairly bear the same relation to the mental science of the metaphysicians as applied mathematics bears to the pure science. In both instances the aim of the pure science is the attainment of abstract truth; its utility, however, frequently going no further than to serve as a gymnasium for the intellect. In both instances the mixed science aims at, and, to a certain extent, attains immediate practical results of the greatest utility to the welfare of mankind; we therefore maintain that our JOURNAL is not inaptly called the *Journal of Mental Science*, although the science may only attempt to deal with sociological and medical inquiries, relating either to the preservation of the health of the mind or to the amelioration or cure of its diseases; and although not soaring to the height of abstruse metaphysics, we only aim at such metaphysical knowledge as may be available to our purposes, as the mechanician uses the formularies of mathematics. This is our view of the kind of mental science which physicians engaged in the grave responsibility of caring for the mental health of their fellow-men may, in all modesty, pretend to cultivate; and while we cannot doubt that all additions to our certain knowledge in the speculative department of the science will be great gain, the necessities of duty and of danger must ever compel us to pursue that knowledge which is to be obtained in the practical departments of science with the earnestness of real workmen. The captain of a ship would be none the worse for being well acquainted with the higher branches of astronomical science, but it is the practical part of that science as it is applicable to navigation which he is compelled to study."—*Sir J. C. Bucknill, M.D., F.R.S.* (*Journ. Ment. Sci.*, vol. vii, 1861, p. 137).

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JOURNAL OF MENTAL SCIENCE

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No. 394 [NEW SERIES No. 358] JANUARY, 1948. VOL. XCIV

Part I.—Original Articles.

THE TWENTY-FIRST MAUDSLEY LECTURE: NOSOPHOBIA.

By JOHN A. RYLE, M.D.,

Professor of Social Medicine in the University of Oxford; Consulting Physician to Guy's Hospital, London, and the Radcliffe Infirmary, Oxford.

"Fear is more pain than is the pain it fears."
SIR PHILIP SIDNEY.

IN the opening chapter of his *Body and Mind* (1873) the physician and philosopher whom these lectures commemorate wisely insists that our inquiries into human faculties should begin with the elementary and proceed only later to the elucidation of the complex. "Surely," he says, "it is time that we put seriously to ourselves the question whether the inductive method, which has proved its worth by its abundant fruitfulness wherever it has been faithfully applied, should not be as rigidly used in the investigation of mind as in the investigation of other natural phenomena. If so, we ought certainly to begin our inquiry with the observation of the simplest instances . . . ." In the chapters which follow he applies this principle, and—or so it seems to me—provides a number of healthy correctives to much modern thinking and writing, and not least to the opinions of those who have allowed too little or assumed too much in their appraisals of the body-mind relationship. If we have for too long separated psyche and soma, past and present, organism and environment, individual and society, in our attempts to fathom Man, may not an extension of interest in a primitive emotion such as fear, in which the interdependence of all of these is manifest, have value?

My concern to-day will be with some very common and understandable fears and their effects—fears which scarcely one of us escapes, which may be trivial and transitory, but which may also assist the perpetuation of much unhappiness and of both physical and mental illness. For the most part they may be regarded as relatively "simple instances." At least they are elementary by comparison with some of the other mental and emotional conflicts which the physician and psychiatrist encounter in their work. If any less

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simple, the fears which I have in mind are certainly more accessible for study than the immediate fears of present danger.

From the primitive phase of man's history, with its alarms created by pestilence or personal illness—long viewed as the inflictions of gods or devils—we can trace the story of disease-fears throughout the Christian era. Alike in the pre-Christian and Christian periods the fear of pain, disablement or death was buttressed by the fear of unseen agencies believed to be in some way responsible for them. Until quite recent times physical disease was still regarded by many as a punishment for sin, and mental illness as demoniac possession. Modern man, more sophisticated than his ancestors, suffers from an abundance of half-knowledge where they suffered from ignorance, and from enslavement where they more readily enjoyed release by the emotions.

Fears of disease may also be accepted as among the simplest instances of body-mind disturbance in that, once their ubiquity is recognized by the physician, they can be fairly readily unmasked; or, alternatively, without actual unmasking, their effects can often be anticipated or relieved by direct and simple psychiatric methods. And yet we should not, I think, be wide of the mark in suggesting that medical men in all branches of the profession constantly miss opportunities of reassuring scared or anxious patients, and of removing or mitigating the associate symptoms which fears of disease or its consequences create or aggravate. Furthermore, while primitive superstition has declined, there are still numerous customs and traditions and other social influences assisting the prevalence of disease-fears in the community which need not be deemed unalterable to-day. There are thus various actions based upon better individual and social understanding which could, by concerted endeavour, make a genuine contribution to curative and preventive medicine and to individual and communal health. Whether I make an exaggerated claim in respect of the importance and prevalence of disease-fears in our modern world, it remains for others to decide on the basis of the arguments here assembled and their own experience.

Although, for the most part, clinical teachers and the text-books of medicine touch rather lightly upon this subject, it has an evident interest for the world of patients and their relatives, and it should therefore be seriously presented to every student. Geraldine Coster, in her understanding little book, *Psychoanalysis for Normal People* (1932), opens her chapter on adult fears as follows: "Fear of disease is one of the commonest causes of adult neurosis. The ordinary man without medical training is often curiously ignorant, and as it were superstitious, about heredity and infection in connexion with disease. Foolish newspaper articles and half-understood fragments of conversation heard in youth prey upon the minds of people who would shrink from admitting their anxiety even to a physician." This general unwillingness to admit to fears is a particular reason both for their perpetuation, and for the too frequent failure on the part of our profession to give them the full consideration that is their due. In studying fears of disease, we can trace the whole gradation from the natural reactions of healthy people and the physically sick or injured, through the anxious preoccupations of the neurotic, to the morbid obsessions of the insane.

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The Occasions of Fear.

Fears and anxieties in a modern society are of many kinds and they have many causes. Most of them are personal and private, and are so rarely or so slightly accompanied by objective manifestations that the assessment of their frequency in any selected population must, for the present, remain beyond computation. Their effects are more apparent in medical practice than their nature or their causes, and yet the last named, on the whole, are the more readily understood.

After excluding contagious fear or panic and all those major and more urgent fears of injury and loss which may come to us in times of war or civil disaster, there still remain countless day-to-day anxieties which affect both children and adults in varying kind and measure. All of these are apt in civilized man, with his highly organized nervous system, his more retentive memory, his power of foresight, and his tendency to repress the outward display of emotion, to lead to more obtrusive and less transitory mental, visceral and vascular disturbances than may be presumed to obtain among primitive races and animal species. Some human fears are related to the known and the natural, some to the unknown, the half-understood and the supernatural. Common observation tells us that the occasions for these prevalent fears include, for example, ideas relating to admonition or punishment; to ridicule or social censure; to loss of employment and earning capacity. Others are connected with the uncertainties of new undertakings, of new jobs or of sexual experience; and others again with the problems of sin and the hereafter. And yet the physician's experience may well lead him to suppose that none of the fears traceable to these specified occasions exceed in frequency those which are born of ideas and misconceptions connected with physical or mental illness.

Every present physical pain or discomfort and every evident injury or outward sign of broken or threatened health which compels, or should compel, a visit to the doctor is capable of promoting anxiety. The more anxious by temperament the patient, the more readily will it do so, but the steady and courageous are not immune. It is true that injuries, if not too grave or trivial, may also be accompanied by a sense of resignation, resentment, relief, or (in youth) even of pride and importance, which can replace or over-ride present anxiety and the fear of the circumstances which caused them. War wounds in the first world war were never, in my experience, accompanied by the manifestations of "shell-shock." There are also invalid persons who "enjoy" their sickness for the sympathy and escape from responsibility which it secures; their fears lie in other directions. In grave conditions of surgical shock and haemorrhage or advanced illness, fear would seem to be largely eliminated by the altered sensibilities accompanying these states, so that conditions of extreme danger are often, at the time, not appreciated as such by the patient. The anxieties due to frank physical illness or trauma are, however, less common than those due to ideas of physical disease prompted by hearsay or by minor symptoms of passing functional derangement. Of all these anxieties, however initated, the vast majority go unspoken, and a

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small proportion only, let it be repeated, are recognized at their true worth when medical advice is sought.

Some years ago I had occasion to ascertain the frequency and order of frequency of the common diseases seen by me up to that date in a general consulting practice. I found that among the twelve diagnoses which scored highest in my card index, *Anxiety* came second on the list. This diagnostic label was employed only when I judged it to be the main basis of a patient's symptoms and the physical examination revealed no sign of serious organic trouble. In the aetiology of four of the remaining conditions, including the first on the list, mental stress and anxiety are now believed to play at least a contributory part. In what proportion of all these cases the symptoms were due to or buttressed by specific disease-fears, as distinct from or additional to other causes of anxiety, I cannot say, but I am satisfied that it was a large one. Apart from the cases included under this generic label of *Anxiety*, a much smaller group were specifically indexed under such headings as "Cancer Phobia" and "Syphilophobia."

Even among ostensibly healthy persons unspoken fears are common. My colleague, Dr. R. W. Parnell, has analysed for me his findings in the case of 155 university students (representing some 60 per cent. of a group accorded the opportunity of a free health examination) who were not at the time under medical care. Twenty-two admitted to anxieties, and of these ten were harbouring anxieties about disease.

Physical pains and fears are, after all, the two primary dis-eases which our patients bring to us; and the latter are generally brought to us in the guise of the former.

The Recognition of Fears.

It may reasonably be asked how fears to which patients do not openly admit can be recognized as operative or assessed as contributory to illness. The first essential is that they should be thought of. The evidence is otherwise generally indirect. It is seldom such as to carry the conviction at once of objective signs, but it may be more important than objective signs, and we do well to remember that many of our most accurate diagnoses in practice are, and always will be, based upon history and subjective symptoms. The recognition of fears, improving with the growth of experience, is usually based upon (1) the history of the patient and his family; (2) the nature of his symptoms, whether they be physical or mental, or both; (3) observations on his temperamental qualities and present demeanour; and (4) the response, in the form of immediate relief and subsequent improvement, to treatment consisting of simple explanation and reassurance—where these are possible—and of a reasoned optimism, encouragement or comfort where they are not. The less such treatment is confused by other measures, the more reliable will the conclusions be. In some cases it is appropriate to inquire, at a selected stage in the association of doctor and patient, whether a specific fear of disease has, in fact, been at work. In others it is wiser to assume its presence and to emphasize, after a careful examination and without the leading question, that "there are no signs of organic disease" or no signs of tuberculosis, appen-

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dicitis, cancer, or such other condition as the symptoms may have seemed to suggest. The outward features of acute fear are rarely observable in the more restrained portraiture of chronic or recurrent anxiety. The pallor, tremor, sweating, dry mouth and tachycardia of the former—although present on occasion—tend to be replaced in the latter by intermittent gastric, oesophageal, colonic or cardiac discomforts or pain and by vasomotor instabilities. The face is marked rather by the stigmata of care than of alarm. At the time of a consultation we must accept that apprehension regarding the interview and the examination can be as potent as the fear of an adverse verdict, and allowance must be made for this in interpreting signs of agitation.

Definition and Varieties of Nosophobia.

The word "nosophobia" means neither more nor less than "the fear of disease." It has been applied more particularly to obsessional fears relating to a particular malady, but there is no sound reason for this restricted usage. Such fears differ from the others only in that they are graver in their degree and consequences and more persistent. They are an expression, in part, of inherently unstable personality. I shall here apply the term to all forms and degrees of fear or anxiety, whether rational or irrational, connected with disease or ideas of disease. These may be held to include:

1. Fears about an existing illness or injury and its possible import; about the tolerability of anticipated pain; and about confinements, anaesthetics and operations which are, for the patient, an occasion of trauma and a common cause of dread and apprehension.

2. Fears of inheriting a disease, particularly epilepsy, insanity, cancer and tuberculosis.

3. Fears of acquiring diseases, particularly those due to well-known types of infection.

4. Fears connected with a non-existent disease which a patient nevertheless imagines or suspects (usually on the basis of some subjective symptom) that he has already acquired.

5. Fears of death or dying considered as the final malignity of illness and, in the latter case, too widely suspected of involving painful or distressing experience.

In all of these, and particularly the last, popular ignorance or the factor of the "unknown" plays a part. In any one of them the fear may be related to ideas of personal suffering or disability associated, whether in fact or imagination, with the disease in question, or to its consequences for others. A fear about disease, whether real or imagined, in a near relative, and especially in a consort or child, constitutes another kind of nosophobia. In this case anxiety can be transferred from one person to another, may react unfavourably upon the patient, and may even come to involve a whole family. The timid and neurotic child of over-fond and protective parents is a familiar product of habitual anxiety or recurring domestic panic.

Nosophobia is to be thought of both as an individual and, by reason of its prevalence, as a social problem. It is traceable in part to social influences,

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and it lessens communal efficiency. In common with other social diseases, its extent and influence fluctuate within the community and vary from community to community. It would almost certainly be found to be commoner in the town than in the country, and among mental rather than manual workers. It has, I suspect, reached a high degree of prevalence in the urban populations of the United States, where disease-consciousness is more assiduously cultivated by the press and other agencies than in our own country. Although panics due to the major epidemic diseases have largely disappeared from the western world in concert with their increasing control, there are signs that popular nosophobia of a less patent type is widespread and contributing to much of our present-day neurosis; and this notwithstanding that we command more instruments for the protection of life and the prevention and relief of sickness than in any previous age.

Where treatment and prevention are concerned it is therefore necessary to think not only in terms of individual but also of social psychiatry and appropriate public actions. To these ends the first essential is an advancement of our understanding of the varieties, manifestations and causes of what it is desired to counter.

Varieties of Nosophobia.

The varieties of nosophobia could be variously determined and classified by such factors as the severity of the disorder or the degree of specificity of the operative fears, or in other ways. We should, in all probability, find that the most grievous varieties are the least frequent and the lesser varieties the most frequent and tractable; that the specific fears in a modern society are more common than the non-specific; and that the causal influences are always multiple. The manifestations would include both changes of mood, in the direction either of agitation or depression, and physical symptoms. The latter usually have a visceral or vascular notation, a rather indefinite character and time-behaviour and show a relatively slight connection with physical events, and often a reference to several systems or somatic areas—a feature usually inconsistent with a diagnosis of organic disease (*vide* Cases 1, 2, 7 and 8 reported hereunder). The symptoms, in brief, do not differ from those attributable to other anxieties, excepting in so far as a relation between the part affected and the specificity of the fear may be discernible.

For simplicity of description, I propose to consider some types and examples of nosophobia under the three headings of (*a*) obsessional nosophobia; (*b*) nosophobia accompanying structural disease or injury and certain alarming episodes; and (*c*) nosophobia occurring independently of these.

Obsessional Nosophobia.

Victims of this form of the malady are usually psychoneurotic or psychotic persons. Their fears are irrational or slenderly based. They may be superimposed upon emotional disorder having other origins. They become firmly implanted, and are not readily uprooted even by examinations of the most searching kind in concert with the fullest assistance of psychotherapy. Syphilo-

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phobia is a familiar example. It may affect those who have never been exposed to infection in the ordinary way and yet the sense of guilt or taint —sometimes referable to a faulty, puritanical upbringing—is strongly operative. Serious mental breakdown is common. Obsessions in regard to tuberculosis, cancer, appendicitis and heart disease are also encountered, but in my experience have usually appeared more manageable.

CASE 1.—*Syphilophobia.* A nervous man, aged 31, married and with children, developed warts on the hands and a friend told him that they were venereal. He was terrified and began to be physically "sick with worry." Pains in the joints followed and then he thought he had a stricture. He lost energy and all interest in his business and dropped two stone in weight.

CASE 2.—*Syphilophobia.* A man, aged 35, who had been a prisoner in German hands during the first world war for four years, was treated during that period for a urethritis, but denied exposure. After his return he was pronounced free from infection, and his blood W.R. was also negative. In the course of the next few years he had much sorrow and loss, his first wife dying in childbirth and his second from a cerebral abscess. A year before I saw him his urethral discharge reappeared. He was treated without a bacteriological examination. My notes state that "he has developed a persistent obsession that he has syphilis. He complains of pains in the sacrum, the perineum, the neck, the eyes, and under the finger-nails, of flatulence and insomnia and has lost a stone in weight." I discovered a to-and-fro aortic murmur (which was rather disconcerting), refrained from discussing it with him, and admitted him to hospital for further investigation after giving a reassuring forecast. There we obtained another negative blood test and also a negative urethral smear, and, in explanation of the murmurs, a history of three attacks of rheumatic fever in boyhood. He was at the time much comforted by these reports and by a further explanation and strong reassurance, but I have not heard how he fared subsequently. The background of a long imprisonment and his domestic tragedies probably played a large part in maintaining his anxiety of mind and conditioning the phobia into which it had crystallized.

CASE 3.—*Infection phobia.* A student contemporary of mine, now dead of a disease which he probably never feared, developed what amounted to a compulsion neurosis in regard to the possibility of infection. Having washed in the hospital he would wash again in the students' club before his meals, open the swing doors with his elbows, eat his College lunch, and then flame the end of his cigarette before putting it in his mouth. The unhygienic condition of the kitchens and dining-hall in those days and the fact that the food and the utensils must have passed through many unwashed hands before they reached him did not seem to worry him. The fact that hundreds of men risked dining in College year after year, took none of his precautions and yet acquired no fell disease had also failed to impress him.

Although we may assume an inherent liability in each of these cases, in each effective extraneous influences precipitated the mental sickness or unbalanced behaviour.

NOSOPHOBIA ACCOMPANYING PHYSICAL DISEASE AND CERTAIN ALARMING SEIZURES.

An episode such as an haemoptysis or haematemesis, an anginal attack, labyrinthine vertigo, a vaso-vagal attack (Gower's syndrome), fainting, an asthmatic attack and the aphasic or hemiplegic varieties of migraine, may very naturally cause acute anxiety, both in the victim and those about him. Here, prompt action can often be taken by the doctor, and his very presence

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is reassuring. It is never, however, superfluous to make positive, comforting pronouncements, even while medical judgment is still hampered by uncertainty. Situations familiar to the physician and not conveying ideas of too grave a risk to him may, it must be remembered, be infinitely alarming to the lay mind. If we exclude a few incurable diseases, the moribund state, and certain crises accompanying the extremes of age, optimism is, in fact, far more frequently justified than pessimism, even in many of the more hazardous situations.

In recurring conditions like *angina pectoris*—although it is often consistent with many years of useful life at a reduced level of output—the name and nature of the disease, the frequent physical reminders of the pain, and sometimes the distressing "sense of dying," may between them give rise to haunting anxieties and unnecessary modifications of living. Here we may witness a return of mental peace, a resumption of interests and other physical and mental improvements as the immediate consequence of nothing more than explanation and a more reassuring prognosis. Cardiologists, like other specialists, are sometimes preoccupied rather with the organ than the person; with physical instructions and treatments rather than with intimate human understanding. Their intellectual caution and desire for accuracy in the matter of prognosis, while frequently supported by reason and experience, need not be betrayed to the patient, nor made too explicit to relatives. Reputations are not lost by preserving hope, even when the hope is falsified.

In *labyrinthine vertigo* patients are not infrequently afflicted with the dread of strokes or death in an attack or of attacks while crossing the street. Few things, after all, can be more provocative of anxiety than states of complete instability and incapacity arriving "out of the blue." Here again I have seen simple explanation and vigorous reassurance do great good. Although the opinion is insusceptible of proof, it has even seemed to me possible that resultant improvements in general and mental health may sometimes lessen the liability to the attacks. Sensible, direct psychotherapy and counsels of patience in such cases should usually be considered preferable to modern surgical procedures which involve no small risk and may introduce yet another anxiety.

Petit mal, especially in intelligent professional men and women, can be a cause of serious apprehension, particularly in relation to loss of skills and earning power and the possible supervention of major epilepsy. Here, too, I have seen patients, including colleagues, greatly assisted by explanation and by a good prognosis, later fully justified by history and performance. *Fainting attacks* in young people, and innocent palpitations or undue awareness of normal cardiac action at all ages, are frequently feared as manifestations of organic heart disease. Here reassurance and explanation are almost the whole of treatment. In many other diseases, acute and chronic, rapid improvement follows so often upon a more favourable forecast than had previously been allowed, and upon the resulting change of atmosphere in the house and sickroom, that it is difficult to doubt the reality of unexpressed fears as a retarding factor in recovery or the uses of optimism in treatment. In the more chronic conditions, such as arthritis and the dyspepsias, the physical

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symptoms, never long in abeyance, both aggravate and can be aggravated by anxiety. Even in these tiresome conditions a better prognosis and encouragement to "live more normally with a view to feeling more normal" may bring help. May not the quick recoveries of children, their frequent happiness during long hospitalization and their immunity from some of the commoner chronic diseases of adults be due not only to their shorter exposure to adverse influences and to the relative resilience of their youthful and growing tissues, but partly also to their freedom from foreknowledge and foreboding?

Nosophobia Without Definite Disease.

This is by far the largest category. In a high proportion of cases the fears are related to cardiac or abdominal symptoms.

My case-records include those of a number of medical men and women who came in fear of cancer or other organic disease, a fear frequently based upon symptoms which would scarcely have given them pause in the case of their own patients. Personal anxiety inevitably hampers judgment. For this reason alone we are, or should be, reluctant to treat ourselves or our own kith and kin. If we look back upon experience—and how easily we tend to shelve it!—we can scarcely fail to recall instances, pronounced or trivial, of personal nosophobia in times of fatigue, sickness or stress, on the eve of an operation, or in the presence of an unexplained symptom. Medical students and graduates have their disease-fears like other people, and have been grateful for their mitigation by understanding colleagues. The more reason why, in the course of practice, they should allow no other preoccupation or exigency to excuse the additional time needed for one of the simplest and most salutary of all psychiatric exercises.

Prevailing Causes of Nosophobia.

In the individual an operative nosophobia—by which I imply a state of fear or anxiety too frequently engaging consciousness or giving rise to symptoms—has clearly, in common with other diseases and especially those of a chronic or recurring kind, a multiple factor aetiology. Within the complex of causes we may separate such factors as the temperament of the individual, moulded to a state of susceptibility by a combination of genetic and environmental influence; antecedent stress or anxiety of another kind increasing sensibility and promoting bodily sensations, which in turn evoke the new specific fear; a half-knowledge of the disease feared due to reading, acquired through gossip, or prompted by public pronouncements or actual aquaintance with a sufferer from the disease; the usual native unwillingness to confess the fear to others, including the doctor, even when he is consulted for associated physical disturbances; a consequent inappropriateness and ineffectiveness in the treatment prescribed; and finally, the uncommunicativeness of medical men, their failure otherwise to inspire confidence, and, more rarely, their indiscreet pronouncements. A physical symptom or finding may create an anxiety, and an anxiety may create a physical symptom. The traffic of impulses between body and mind is a two-way or circular process. Mind

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and body cannot—as Maudsley always insisted—be conceived as separately existent or functional, nor can they, with optimal results, be separately treated.

Popular fears of disease are variously propagated. Vulgar errors may be less numerous and less fantastic than they were in the days of Sir Thomas Browne, but they are still very common and a cause of much timid living and neurosis. Errors of belief and practice are passed as old wives' tales from neighbour to neighbour and mother to daughter, when they relate especially to pregnancy, childbirth and the supposed necessity for habitual purgation. Ignorance of the most elementary anatomy, physiology, psychology and pathology is still prevalent even among the otherwise well educated.

Fears of disease are widely engendered through the advertisements of proprietary medicines; by the outpouring of ill-judged medical articles in the lay press, of a type even more familiar, perhaps, to American than British readers; and by unorthodox practitioners. All of these make the appeal to fear a part of salesmanship, even though they seek simultaneously to inspire hope by promises of cure, promises which give them a competitive advantage over the honest doctor. The latter, by the more frequent recognition of fears and the employment of simple explanations and rational optimism, could, without doubt, enhance the value of his own treatments and, in the process, do much to shake belief in the unorthodox. Educationally, much could be done along the lines sponsored by the Central Council for Health Education and the personal and publicity services of the public health departments—not by mere condemnation, but by the appeal to reason and to the health rather than the sickness interest—to counter the evil effects of ignorance, superstition, and the traffic in proprietary remedies. Whatever part the various agencies cited above may play in promoting popular nosophobia, we must also reluctantly admit that the very people—doctors and nurses—who should do most to relieve disease-fears often fail to do so and sometimes inadvertently accentuate them.

The Doctor as an Aetiological Factor in Nosophobia.

In contradistinction to the welfare doctor, the Service doctor, and the physician in charge of a student health service (who start with the health perspective, and are mainly concerned with keeping mothers or others informed and hopeful and babies or other young people well), the practitioner, the consultant and the specialist start with the disease perspective, and are under the constant necessity of looking for or not overlooking organic disease. They, too, labour under an anxiety. They often encourage fears unwittingly through their partiality for prescriptions and operations; through their use of generic labels such as gastritis, neuritis, rheumatism, tired heart, and debility, all of which tend to suggest physical disease and chronicity or slow recovery to the patient's mind; and through their caution or their silences. Specialists in the physical branches of medicine too often err through concentration on a part of the body to the neglect of the whole person. The psychiatrist must frequently reduce his powers through failure to make a proper examination of the body. The general physician who gives the time requisite for a careful

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history and a complete overhaul and a sympathetic explanation of his findings holds a very real advantage over those who do not or cannot afford the time, or who confine their interest to parts of the body or the mind. In our specialist age it has, in fact, become a major function of the general physician to examine thoroughly, to explain simply, to reassure as far as may be, and to protect his patients from unnecessary medical or surgical interventions. The routine functional inquiry and physical overhaul will again and again reveal some circumstance which directs attention to an unspoken anxiety. The age and sex of the patient or a casually mentioned symptom or physical finding may suggest the likely fear. The patient past middle life is apt to be concerned about cancer, his heart, or his blood-pressure; the young patient about tuberculosis, venereal disease, his mental state or impotence. Phosphaturia in young men is misinterpreted as spermatorrhoea and may be the occasion of a sexual neurosis. Loss of weight from one cause or another is variously interpreted at different age-periods. "Arthritis" is the nightmare of many people with muscular pains or creaking or clicking joints having no such significance. Even the discovery of a normal anatomical landmark may create anxieties; thus I have been consulted about the ensiform cartilage, which had been taken by the patient for a tumour. There is no end to the fears initiated by trifles, but they are not necessarily trifling fears.

A word about the uncommunicative or inexplicit doctor may not be amiss. He is to be found in all professional groups and among both young and old, but my own experience would suggest—and I have the testimany of many lay and medical observers—that he is, perhaps, more commonly to be found in hospitals than elsewhere. Again and again patients discharged from hospital, when asked what the doctors have told them, say, "Oh, they didn't tell me anything." Often they have spent long periods in the ward and been elaborately investigated, all the time waiting and wondering and uninformed. Could anything be more conducive to the initiation or aggravation of anxiety than experience of this kind? Probably the divided responsibilities which obtain in institutions and the inexperience of house-officers are partly to blame, but the mechanistic, objective character of modern investigations also tends to distract the doctor's from the patients' thought and to direct attention away from private sensibilities and present needs. I have even watched air-raid victims being admitted, examined, X-rayed and transfused without a word of comfort or reassurance being given to them by those concerned.

The pessimistic doctor can also prove singularly unhelpful, however careful and able he may be in other ways.

CASE 4.—A very gallant senior officer in the regular army complained of an attack of faintness and of a recurrent "surging sensation" in the region of his heart. Although he did not openly admit or show it, I had no doubt that he was labouring under considerable anxiety. His father had died suddenly from heart-failure at the age of 59. With the help of consultations at intervals I was able to keep him reassured and he continued to indulge in out-of-door pursuits, including golf, shooting and gardening. Later he had occasion to consult a physician in another city (now no longer living), who was well known to me for his diagnostic ability and his gloomy outlook. He examined my patient cardiographically,

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revealed evidence of myocardial damage not present on a previous occasion and gave a very guarded prognosis. This was followed by a recurrence of anxiety and a further visit, at which I had to pit my assessment against a less favourable opinion backed now by the revelation of a defect of which I had been happily unaware. The patient continued to lead an active life ; six years later he indulged in winter sports, and he was still alive 16 years after the adverse verdict.

We are all fallible, and I have not the slightest doubt that my own errors and missed opportunities have been numerous. But one hears all too rarely of past mistakes, and I am thus compelled to go to my notes of cases illustrating others' failings. If these can teach us something of practical value, they are surely worthy to be placed on record.

The faults of doctors, it will be seen, are mainly faults of omission and due to lack of time or patience or proper training, and, sometimes, even to a dogged belief that it is " better for patients not to be told too much." It is not so much that their knowledge of a simple human frailty is gravely lacking, as that they fail to apply it regularly and to make its application a main feature of their " cure of souls." But there are faults of commission, too, for which even distinguished leaders of the profession must sometimes accept blame. The teacher at the bedside who drifts too easily into pathological discussion is doubly at fault, for he may at once puzzle or disturb his patient and set a bad example to his class. Sometimes the public utterances of doctors show too little thought for the susceptibilities of the public, who are apt to take as gospel all they say. A distinguished surgeon no longer with us, called upon at a large dinner-party to inaugurate a collection of funds for cancer research, was reported as saying to his audience who were seated at small tables, " Do you realize that in ten years from now one person at each of these tables will be dead from cancer ? " Even if he had statistical justification for so dramatic a pronouncement, it was not psychologically justifiable. The same surgeon advised a young man in his twenties, whom I had advised against an operation for cholecystitis, to have his gall-bladder removed lest it might later undergo cancerous change. The pathological opinion was dubious, the expressed opinion indefensible. On both occasions, a public and a private one, he employed fear as a weapon of persuasion. There are rare occasions on which this weapon may be employed in order to compel a patient to submit to an immediate life-saving treatment, but they are very rare.

The Special Case of Cancer Phobia.

Apart from its high mortality and, in many cases, its relentlessness, cancer has inspired fear in the lay mind because of its supposedly inevitable association with grave pain. We would do our patients and the public a real service if we were to remind them more often, firstly, that cancer in its early stages is to-day more readily recognized and eradicable than ever before, and, secondly, that even when intractable it is by no means always a painful disease ; that carcinoma of the stomach, the liver, and the bowel, for instance, at times may run a painless course, and that when the disease is incurable and accompanied by pain a great deal can be done to relieve it. There are causes of death more miserable than many of the cancers which have become a major

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cause of public dread. What to tell the patient who is found to have a cancer and how to tell it is, we well know, a matter calling for the most judicial and humane reflection. The decision varies from case to case, with sex and age, the psychology of the individual, the tractability of the condition, and the estimated prognosis. The manner of the explanation given to relatives also requires the most thoughtful consideration. There are many ways of softening necessary blows, but it is well to insist at all times that there is no case of cancer in which there is " nothing to be done."

Cancer phobia without cancer is, however, far commoner than cancer phobia with cancer. I have carefully perused the notes of 31 cases in which cancer phobia (without cancer) was the specific diagnosis. These must be a mere fraction of the patients seen who harboured the fear in some degree. There were 21 women and 10 men. The average age was 50, the youngest 33 and the oldest 75. Thirteen were described as nervous, very nervous, or as having had a nervous breakdown on one or more occasions. The physical symptoms complained of were generally of a kind associated with emotional disorder. Thus 14, with or without a specific mention of neurosis, were the victims of colonic spasm or other discomforts, of flatulence, globus or rectal spasm, or had had an abdominal exploration. Two patients had duodenal ulcer, and two cholecystitis. One had hyperpiesia. In six cases, all women, there was a complaint of sore or dry tongue or mouth or of altered taste, with no evidence of a local cause for the symptom. In such cases it would seem proper to suspect or enquire for a cancer phobia. In one of these, after completing my examination and while still wondering what could be suggested in the way of treatment, I began by saying, " I am glad to tell you that there are no signs of cancer or any serious disease." " Thank you," came the prompt reply, " that is all I wanted to know." Twelve patients in the series had lost a near relative or friend or neighbour from cancer or had intimate knowledge of a case or cases. Two were in the habit of reading articles in the papers or other literature bearing on cancer.

CASE 5.—A very intelligent middle-aged layman, with expert knowledge of hospital administration, developed a troublesome lumbo-sacral pain after a blow in the back. On a basis of his medical half-knowledge and a vivid imagination, his age, the persistence of his symptom, and a contrast of his present state with his normally good health, he built up an association which seemed to support his fear of cancer. He slept badly and lost a stone in weight. He saw several doctors. He was cured by a single explanation and reassurance. Two years later he was seen for a much slighter anxiety about his heart and again relieved. Later he developed a duodenal ulcer which caused him no serious anxiety and responded to orthodox medical treatment.

CASE 6.—A spinster, aged 70, had twice been treated successfully for rodent ulcers. Her brother had died of cancer of the gullet. Her friends told her that she was getting thin. She had lost a stone in weight, but had taken four years to do so. She was given to reading literature about cancer. There were thus several good causes for her fears.

CASE 7.—A married woman, aged 61, suddenly developed a bitter taste in her mouth, and later cold feelings in the body and slight pains in neck and shoulders. She worried more and more about these symptoms and slept badly. Two distant relatives had recently died of cancer. She had seen a doctor, but had not been

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given a complete overhaul or a reassurance of the kind she needed. Eight months later her daughter reported that she had been well from the day of the consultation.

CASE 8.—A nervous, unmarried woman, aged 47, and passing through the climacteric, had twice had a nervous breakdown in earlier life. Her mother and paternal grandfather had died of cancer. Two months previously she had begun to worry and to sleep badly because a friend of hers was dying of cancer. Her symptoms included pains in the throat, rectum, and vagina. Three years previously she had had a disease phobia in association with abdominal symptoms.

It will be seen from these histories that the fears which we unearth in our patients are often by no means unreasonable, and that multiple factors are usually at work.

THE FEAR OF DYING.

I have written elsewhere (1940, 1941) of fears of death and dying. In an earlier age when doctrines relating to the after-life conjured grim visions of purgatory and hell, these were, we may presume, an added cause of apprehension. They have their lingering influence still. But to-day people do not on the whole fear death itself so much, excepting in so far as it carries with it the idea of separation from loved ones and of impending hardship for those left behind. Fears of the process of dying, however, are far from rare and are sometimes very real. It is quite commonly supposed that the experience must inevitably involve urgent suffering or pain. This is due largely to the appearances and associations of the moribund state, the " Groanes and Convulsions, and a discoloured Face, and Friends weeping " of Bacon's essay. It is a false inference that such scenes must involve distress for the central player. We have good reason to believe—not only in conditions directly affecting the brain, but also in surgical shock, haemorrhage, pneumonia, congestive heart-failure, septicaemia and many old-age deaths—that the last minutes, hours, and often days, are usually a cloudy period, at the most a time of twilight consciousness. Medical observers who have themselves narrowly escaped death from such causes, and also from sudden accident, rarely admit to any recollection either of bad physical suffering or of fear at the time. The popular view, however, still goes uncontroverted, and novelists and dramatists continue to portray death-bed scenes in a most incorrect way, falsely exaggerating suffering, and generally depicting a clarity of mind in their victims which is quite outside medical experience. No opportunity should be lost, therefore, of explaining to patients discovered or thought to be fearful of the end, and to the relatives of most patients nearing the end, that physical pain and mental anguish, or at any rate keenly appreciated pain and anguish, in this phase are exceptional and, when present, in large measure controllable by appropriate management and drugs. Where good medical and nursing care are available, the occasions which justify euthanasia are infrequent.

The strange and intensely alarming " sense of dying " which accompanies certain nervous and physical states must be clearly distinguished from the " fear of dying." It is—as Clifford Allbutt insisted (1915) and my own numerous observations (1928, 1935) confirm—an organic or physical sensation,

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and it may be accompanied by well-defined objective phenomena. It is encountered in a small proportion of cases of angina pectoris and labyrinthine vertigo, in anaphylactic shock and after too large a dose of adrenalin, or perhaps after a proper dose accidentally given into a vein. It is the major presenting symptom in the vaso-vagal attacks of Gowers. It is associated with abrupt changes in blood-pressure such as commonly obtain in all of the above-named conditions, and there are reasons for regarding it as due to a vasomotor disturbance at the medullary level. It is possible that it may sometimes precede death from angina pectoris and anaphylactic shock, although these are, as a rule, so instantaneous that there would scarcely be time for its appreciation. Otherwise, it is consistent, however frequently it may recur, with long life. This aura of mortality is therefore a deceptive omen, and knowledge of this can help to buttress reassurance and assist the treatment of cases. We may not be able to persuade the world so to adapt itself as to believe, with Spinoza, that "a free man thinks of nothing less than of death; and his wisdom is a meditation not of death, but of life"; nevertheless, the liberation of many from needless fears of dissolution and terminal agony is well within our power.

Summary.

1. The fears engendered by disease and ideas and misconceptions relating to disease and its consequences are widespread, and a potent cause both of mental fret and more serious neurosis, often accompanied by physical symptoms.

2. They are, to a large extent, dependent upon ignorance, encouraged by reticence and stimulated by gossip and by widespread commercial enterprise and ill-considered magazine articles, and by fiction and the drama.

3. The medical profession is in part responsible for their frequency. Through inadequate or ill-balanced psychiatric training in the student period and undue reliance on physical remedies, opportunities of relieving minds and bodies are constantly missed. Specialists, whether in organs or in therapeutic methods, tend to distract their own attention from the patient and his total need. More rarely, nosophobia is positively encouraged by unwise medical pronouncements, whether made in private or in public.

4. The extension of simple health education for the general public, especially in early life, could do much to counteract, by promoting an intelligent interest in healthy living, the prevalent disease-consciousness of the present day. Periodic health examinations in youth and afterwards can have a high "reassurance value."

5. A better editing of medical articles for the Press, whether written by doctors or laymen, would be salutary. Recent enactments to ensure a better control of the abuses of the proprietary medicine "racket" have made their contribution, but a more complete control is needed. Few forms of profit-making enterprise are more despicable than those which trade upon fear and unjustified promises, which pander to ignorance, and lead all too frequently to the postponement of accurate diagnosis and appropriate treatment.

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Conclusion.

Clinical and sociological studies in the natural history of disease should generally give full scope to objective and numerical methods of enquiry. For this occasion, however, I have chosen a subject not readily adapted to such handling, excepting in so far as careful physical assessments must always be involved. I have done so deliberately, partly because I have so often seen the fears of the sick and injured, in peace and war, go sadly under-estimated, and partly because it is to-day more than ever necessary to strike a just balance between our materialist science on the one hand and our humanist science on the other.

If it were possible to make a survey and a follow-up study of all the cases of nosophobia—major and minor, rational and irrational, of short and long duration—in a given community or practice, we should probably find that a considerable proportion, especially of those developing in young people, undergo resolution with the passage of time and the growth of experience. Others would be found to be relieved by the illness, injury, anaesthetic, or operation which had been feared—the original anxiety often appearing foolish in retrospect. Others again would be quickly cured by the doctor. Only a small proportion would be found to be chronic and incurable. There would still, however, remain another category of cases, possibly exceeding all the rest, in which fears passing undetected would continue at intervals to promote distress of mind and physical symptoms. We cannot, in fact, calibrate the sensations of fear with those of pain, and we should never under-rate the latter, but if frequency and duration rather than degree were the measure of the influence of fears, Sir Philip Sidney's dictum—quoted at the head of this lecture —would, surely, not be extravagant.

As a profession we are losing, in the process of developing our technologies, something of the philosophy, humanism and courage of the older physicians. Our loss of philosophy is shown in our inability to piece together the components of an illness or an individual, to assess the roles of mind and body in morbid experience and to balance the needs of both—in brief, in our inability to see things "whole." Our loss of humanism appears in our too partial success in assessing the psychological needs of the individual and the social needs of the community. Our loss of courage is chiefly manifest in our present-day unwillingness to make pronouncements without subjecting our patients to elaborate investigations. These, while often necessary and valuable, can also prolong anxiety, and leave our own doubts and questions still unanswered. Without courage to accept clinical responsibilities we cannot impart courage to our patients. Without a reasoned clarity in diagnosis and a reasoned hopefulness in prognosis we cannot properly counter fear. In the majority of cases it is possible to give to patients a simple interpretation of symptoms; a simple idea as to how they should be regarded; a set of sound reasons should further inquiry become necessary; a provisional prognosis, in which the emphasis should be on the better chance whenever possible; and an intelligent plan of action. For the busy practitioner or hospital surgeon or physician, it may well be impossible to devote time and thought to the more profound

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psychiatric methods, but there should always be time to examine carefully, to explain clearly, and to reassure as fully as the circumstances allow.

Among the simplest instances of body-mind disorder are states of fear attaching directly to the body and the mind and their mischances. To prevent and treat them effectively in the individual, it is chiefly necessary to remember their existence and ubiquity. For their better control in the community we shall require the aid of education and the law.

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PSYCHIATRIC HYPOTHESIS AND PRACTICE.*

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It is a very great honour to occupy the Presidential Chair of the Psychiatric Section of the Royal Society of Medicine; it is one which I appreciate most highly, and thank you warmly for.

It has been said that to preach is not merely the ambition, but indeed is in the blood of all Scotsmen, and that in whatever place they find themselves they are apt to think of it as a pulpit, and proceed to deliver a sermon or discourse. I trust that I shall neither be so ambitious nor so dictatorial. In the light of modern psychiatric practice I intend to try to answer in some degree whether it is always necessary, so as to effect progress, that theory and practice should keep in harmony with one another. I am attempting to do this from the point of view of a clinical psychiatrist who has now spent many years in mental hospital work, and has had the privilege of being a consultant and teacher. My contribution, therefore, must be essentially practical, must deal with the issues which have come prominently before me, and must have for its particular aim how most wisely to instruct those undergraduates and post-graduates who are interested in the wider aspects of medical practice, and perhaps in psychiatry as a speciality. To guide them aright is a very serious and responsible task. It means that fairness and discrimination require to be exercised, and that personal experience with the issues involved, whether of an etiological, diagnostic, prognostic or therapeutic nature, is absolutely essential. I have very little patience with those cold intellectualists who, on the basis of this, that, or the other hypothesis develop personal prejudices, constitute themselves into judge and jury, and then, to their own entire satisfaction, proceed to condemn and sentence all their colleagues who do not agree with them. Such an attitude is much too intolerant and arbitrary, and inevitably leads to bias, dissatisfaction, and greater prejudice. Most of us appreciate, the longer we work in psychiatry, how complex and difficult the field is, but nevertheless it has become far more attractive than it was formerly. This is evidenced by the fact that so many more young men and women taking up medical work are keen and enthusiastic to understand more and more about the fundamental aspects of psychiatry, and the psychological factors involved, whether they are going to become psychiatric specialists or not. They are swiftly recognizing that psychiatry has a message, an assured place in the medical hierarchy, and that the study of the whole man in relation to his

* The Presidential Address delivered to the Section of Psychiatry, The Royal Society of Medicine, on 14 October, 1947.

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environment constitutes a live dynamic issue which has, as yet, never been successfully grappled with. Yet it is only by pursuing such a course, and such studies, that we are likely to come to that fuller understanding of human conduct which may lead, eventually, to a more harmonious and more stable state of mental health.

I must not, however, press the above argument further, otherwise I should be led into a discussion of the whole problem of mental hygiene, of social psychiatry or "sociatry" as Moreno would prefer to call it, and of all the practical measures of a preventive and social nature which we must pay attention to. Instead I must hasten back to my more specific task. I shall strive to show that although psychiatry has occasionally been a little diffident, shy, wayward and temperamental, yet it has always remained true to the ideal of bringing comfort and care to those distressed in mind or body, and has not been so fickle as some would have us believe. As I have stated previously, I, like many of the rest of you, have had the responsibility of advising and guiding large numbers of students and post-graduates, and at the same time have required to gain and retain the confidence of well-informed medical and surgical colleagues, without whose co-operation progress would have been impossible. Perhaps then you will extend your courtesy to me still further if I venture to be a little personal. Let me add, however, that—

> "I am not one who much or oft delights
> To season my fireside with personal talk,"

but on this occasion amongst psychiatric colleagues and devoted friends I may be pardoned if I subscribe a background to what I have to say.

During my years of psychiatric training and practice I have had an opportunity to read about, listen to, and witness many changing concepts and ideas, I have seen the rise and decline of many forms of therapy, and I may even have taken part in somewhat violent and heated arguments in regard to the significance of this or that particular trend. Here and there we have had our great disappointments. Methods of approach, forms of treatment warmly acclaimed by their enthusiastic adherents have had their brief hour of glory, and then as their limitations have been realized they have tended to sink back into obscurity. But they have not been entirely unavailing; they have been honest failures, because all of them have had for their purpose the idea of progress, the thought that in some way a greater degree of human betterment could be effected, and even although the results may have been transitory, yet they were stepping-stones to further effort. Psychiatrists in general, I believe, have had a fair share of what my friend, Colonel A. D. Stewart, talks about as "disinterested intellectual curiosity"—the inquiring spirit which, I understand, led Archimedes to discover the science of hydrostatics, and Pythagoras to develop and perfect the pentatonic scale. McNeile Dixon, in his Gifford Lectures entitled "The Human Situation," has much to say on the same topic and mentions Pasteur, "who revealed the undreamt of universe of micro-organisms, revolutionizing the whole art of medicine, and Mendel, a simple parish priest, whose name does not even appear in a cyclopaedia of

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1891, threw open the gates to the study of heredity, setting forth the laws which govern its mysterious configurations." And then when talking about the unconscious he writes: "The repercussions of the knowledge already gained of this underworld are only beginning to be felt in medicine. It will not end there; they will be felt further afield, in our legal system, in our treatment of social offenders, in our estimates of human conduct. It has only lately dawned on us that transgressors of the social code are as often sufferers as malefactors." It was surely just this same quality of disinterested intellectual curiosity which in recent times led Egas Moniz to formulate his conception of brain function, leading to a surgical operation which has contributed greatly to neurological and psychiatric knowledge. But more of that later. In the meantime let me cast your minds back into the not too remote past.

In 1907, when I was fortunate to obtain a place on Sir Thomas Clouston's staff at the Royal Edinburgh Hospital, I was introduced to a mental hospital organization which had been tried and tested and had not been found wanting. While there I came under the guidance of one of the most brilliant psychiatrists this country has ever produced. I refer to the late Charles Macfie Campbell, who eventually became Director of the Boston Psychopathic Clinic and Professor of Psychiatry at Harvard University. After his initial training in Edinburgh Campbell studied neurology with Pierre Marie in Paris, he worked on brain pathology with Nissl in Heidelberg, and he had received his clinical training in psychiatry with Adolf Meyer at the Psychiatric Institute, Wards Island, New York. He then returned to Edinburgh as an assistant physician at Morningside, and it was at that time that I came under his influence. I remember his infectious enthusiasm, his nimbleness of wit, and his great desire to bring all his great resources to bear in furthering the cause of psychiatry. He introduced me to the clinical formulations of Kraepelin, he laid great emphasis on careful clinical differentiation, and his case reports and summaries were a model of what such things should be. No one associated with him could help being influenced by such a vital personality. That was the period of descriptive psychiatry, when emphasis was laid on the careful recording of signs and symptoms, when the approach was objective rather than subjective, and when all our efforts were bent on correlating the clinical with the pathological. Is it much to be wondered at? You must not forget that in those days padded rooms and strong rooms were used extensively; crude methods of physical treatment by blisters, setons, restraining sheets and excessive sedation were in the ascendant; the nursing staff, particularly at night time, was quite inadequate; and the wards were crowded with noisy and disturbed patients, many of whom, I believe, were manufactured and perpetuated by the methods employed. One of the impressions which remains vividly before me was the large number of cases of general paralysis in various stages of mental and physical deterioration. Many were completely bedridden, bed-sores were not infrequent, a haematoma auris was not difficult to demonstrate, and the grinding of teeth was a noise which had to be heard to be believed. Ford Robertson and his colleagues worked unceasingly to find a cure not only to relieve the suffering, but to decrease the mortality of a disease which ran its

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inevitable course in a period of from 2 to 5 years. Death must have been a blessed relief, not only to the patient, but to the sorrowing relatives. Think of the dramatic improvements which have been effected: the supercession of mercury and iodide by salvarsan and salvarsanized serum, the discovery of the *Spirochaeta pallida* in the brain cortex by Noguchi and Moore, and ultimately the successful treatment by malarial inoculation introduced by Wagner-Jauregg. The mere recording of the above facts gives no idea of the excitement which participation in such work caused. We had been taught that before a diagnosis of general paralysis could be made, inflammatory and degenerative changes must have occurred to such an extent in the cells of the brain cortex that readjustment was impossible, and that this applied just as much to the early acute clinical cases as to those who had had a more protracted course. The procurator-fiscal of Glasgow became so disturbed by the death of one or two patients who had been receiving malarial treatment that he regarded malarial treatment as a more or less criminal procedure, and unjustifiable. He threatened proceedings against those carrying it on. Yet what a revolution has been effected; cases of general paralysis in our mental hospitals are gradually disappearing, and the scepticism which many of us had regarding the effect of treatment has practically disappeared. The hypothetical and therapeutic pessimism which was based on pathological fact had to give way to the wonderful results which were effected.

Another impression which remains before me is the impetus and drive which existed in the Psychiatric Institute Service, Wards Island, New York, under the direction of Adolf Meyer, and later of August Hoch. Meyer had succeeded Van Gieson, and had insisted that the Institute, if it were to function effectively, must have associated clinical facilities. In consequence two wards were put under his supervision, the female ward catering especially for affective and ideational disorders, the male ward for organic states of all types. The clinical material was rich both in quality and quantity, and the Institute came to form the training centre for the New York State Hospital system, and set a standard which has never been surpassed. It was while he was there, and later at the Phipps Clinic, Baltimore, that Meyer did his epoch-making work on the Fundamental Aspects of Dementia Praecox, on his Reaction Types, and on the development of his concept of Psycho-biology. Hoch and Amsden added their quota by their analysis of personality types. It was about the same time that Freud and Jung introduced their psycho-analytic concepts into the United States by delivering a series of lectures—the Clark University Lectures at Worcester, Massachusetts. As one looks back now and considers the discussions and controversies which occurred then, the violent antipathies and prejudices, the personal acrimony, and then gradually the appreciation that even although the therapeutic results were in many cases disappointing, one realises a system of philosophy and psychology had been built up which is likely to be enduring, and which eventually may lead to further developments. The analysis of dreams, the interpretation of symbols, the application of free association and the elaboration of the association method have all been techniques, and methods of investigation which have meant a great deal in the progress and development of preventive psychiatry, but most

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of us, I believe, will agree that so far as successful therapeutic results are concerned, hypothesis has largely outdistanced practice.

Again we do well to remember some of the other great personalities of that period: the business-like, thorough Kraepelin; the impressive Alzheimer with his kindly manner and vast knowledge; the ever youthful, active Bleuler; the enterprising and imaginative Southard, who suggested that areas of gliosis in the brain of dementia praecox cases might be palpated. It was during this same period that we witnessed the development of organized occupational therapy, of intelligence testing, of industrial psychiatry, and of psychiatric social service, all of which have contributed so much to individual, family and social betterment.

Furthermore—and perhaps more important than anything that has been mentioned so far—we have seen the greater emphasis of psychiatry in our medical schools, in the out-patient departments of general hospitals, in the establishment of special clinics, and in association with mental hygiene associations. And when I think of the International Association of Mental Hygiene, and of how it came into being, that intrepid courageous man Clifford Beers comes to my mind. Beers—the founder of mental hygiene—used to ask himself the question: "Why has my life been spared?" If any of us could give half as good an answer as Beers did we would be amply satisfied. As a result of all the above developments we are entitled to claim that never before has psychiatry been on so active and potentially so fruitful a basis.

But even with all the progress which has been made, there are still vast unexplored territories of mental functioning which require still greater research and investigation. We need not be unduly worried if the approach comes first from one angle, and then from another, if it should swing from the physiological to the psychological—each is supplementary to the other—and therefore we need not be discouraged by our critics, who are always so ready to inform us that psychiatry does not know where it stands. It is only a very foolish and myopic person who sticks obstinately to one point of view; the really strong, intelligent one is willing to be converted by the results obtained, whether by drug-therapy, psycho-therapy, insulin, electric shock, or leucotomy. The important thing is to study one's results carefully, and to regard every new procedure as a matter for further research and investigation rather than as a cure-all for all the psychiatric ills which man is heir to.

A good many years have now elapsed since the "new" physical methods of treatment were introduced, and an attempt should be made to evaluate or estimate where we stand to-day. Most psychiatrists who have used those methods must have passed through periods of considerable anxiety and self-questioning as to how far they were justified in advocating such procedures, or of agreeing to them, either because of the evident distress of the patient, or because of the insistence of relatives, who not unnaturally feel that something more should be done to try to alleviate the obvious suffering. Those who are older amongst us, and who have been accustomed to rely on a degree of psychological insight backed up by sympathetic understanding on the *vis medicatrix naturae*, and on good nursing and general medical care, have tended to be very sceptical regarding the introduction of insulin coma, cardiazol, narco-analysis,

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prolonged sleep, electric shock and leucotomy, but the results obtained have been so impressive not only from the point of view of cure, but of alleviation, that we are forced to examine the whole position most carefully. I do not intend to analyse all the above-mentioned forms of treatment, but to direct my remarks particularly to leucotomy. While preparing this paper I was interested to see that Dr. E. L. Hutton (*Journal of Mental Science*, April, 1947) has expressed a similar point of view, has discussed the contra-indications for leucotomy, and has shown that enthusiasm should be tempered with sober consideration. She has reported that there are a few patients " whose behavour following the operation is definitely less satisfactory that it was at the height of their illness " ; undesirable traits have also been noted in cases which can be regarded as successful. She believes that the basic character and outstanding traits of the total personality are more important in assessing the probable result of the operation than the particular type of mental disorder from which the patient is suffering. Dr. Hutton's opinion fits in with my experience, and for some time I have wondered whether the long-term results have justified the transitory improvements and the methods employed. It is obvious that we should not be carried away by unbounded enthusiasm, nor yet should we be daunted by our adverse critics, many of whom have little or no appreciation of the distress of mentally ill patients or of their relatives, nor the great medical and nursing strain involved in safeguarding and treating patients who have often regressed to a primitive level. I seem, however, to sense a certain danger in Dr. Hutton's statement when she rather minimizes the importance of clinical differentiation. There are still, unfortunately, both research workers and clinicians in psychiatry who are inclined to regard the nervous and mentally disordered as belonging to one category. They think too much in terms of the actual brain structure or lesion, of insanity *sui generis*, and not enough of the actual understanding of the human material with which they are dealing. We need more and more clinical differentiation rather than less and less. It is only right, of course, that our aim should be directed towards finding a common reason or explanation for the successes—partial though they may be—which have been attained, but this is more likely to be done if the research worker and the clinician work closely with one another, rather than in somewhat different camps. It is, I believe, largely because of faulty clinical differentiation that our results are sometimes difficult to assess, and come under adverse criticism. We need our more psychologically minded, our more bio-chemically minded or our more neurologically minded colleagues alongside. Their caustic comments are sometimes extremely good for us. For instance in *Brain*, **70**, 1947, the following appeared : " We read that the prefrontal or forward part of the frontal lobe is concerned with thought, but its precise functions are obscure ; it is very difficult to establish the relationship between such aspects of thought as imagination, initiative and self-consciousness on the one hand, and any given part of the brain on the other." Yet if this psycho-anatomical result is not achieved, the operation nevertheless is designed to " break the connection between the patient's thoughts and his emotions ; and it does this by severing the fronto-thalamic radiations, and ensuring degeneration of the dorsomedial nucleus of the thalamus. We learn later, however, that the

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operation may yet be successful even when it achieves neither of those anatomical results, and it remains therefore an empirical procedure producing its results—when it does—in an inexplicable fashion." Despite the above comment I note that Burlingame, in an Editorial Comment in the *Digest of Neurology and Psychiatry* (August, 1947), states that it was the symposium on the functions of the frontal lobe at the second International Neurological Congress in London in 1935 which encouraged Moniz to develop the idea that the interruption of the frontal association pathways of the brain might lead to the relief of certain psychotic symptoms. It was at that Congress that Goldstein discussed the relations between the frontal lobes and psychic functions. He stated that there was ample evidence to show that lesions of the frontal lobe, especially if they occurred on the left side, were associated with psychic disturbances, which were not necessarily limited to a single mental function. At the same Congress, Brickner stated that the functions of the frontal lobes were concerned with the production of "ingenuity"; but more than ingenuity was required if man was to achieve a harmonious and intelligent control over his emotions. (*Lancet*, 10 August, 1935.) Furthermore Gordon Holmes and others have described cases of moral perversion as occurring in frontal lobe tumour, while Richter and Hines have demonstrated that the conduct of macaques was controlled through the prefrontal lobe, particularly Area 9 (Brodmann), and also through the striatum.

It can be seen, then, that the selection of the fronto-thalamic association tracts was not so strange and arbitrary a procedure as some have been inclined to think, but rather was it a brilliant piece of inductive reasoning—"disinterested intellectual curiosity"—which has given magnificent clinical results.

As an aside may I refer to an amusing editorial which a few days ago was published in the *Scotsman*, and was entitled "Trail of the Snail." The writer mentions how the disinterested pursuit of knowledge may turn into strange channels, and comments especially on how research workers in the University of Maryland have recently established the fact that a snail advances at the speed of .000363005 miles an hour. "It is difficult to visualize a group of grown men spending their time recording with a delicate apparatus the speed at which a solitary snail moves over the surface of the restless earth. Snail pacing must be among the most boring occupations ever undertaken by man. . . . Men who collect Ph.D.'s for plotting the pace of a snail are not the kind of men to blow up the world's fuses. . . . No psychologist has ever determined how timid a mouse is. . . . Amnesia among elephants is also a subject on which there is a good deal of loose talk. . . . No one has ever positively declared how slippery an eel is."

We must take care, therefore, not to be led up the garden path, and we must remain watchful because subtle suggestions are constantly coming to us from a variety of sources. For instance Meyer, Beck and McLardy (*Brain*, **70**, 1947) state: "An operation on human beings producing a brain lesion unpredictable in precise location and extent is, from a purely anatomical point of view, an unqualified boon, since each case, and often each hemisphere, presents as it were a separate experiment." It is, indeed, an ill wind that

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blows nobody any good—and while our psycho-physical correlations, imaginations and practice may be sadly lacking in precision, logic, thoughtfulness, yet our empirical results and operations are helping to keep alive the enthusiasm of the neuro-pathologist, as well as the critical acumen of the clinical neurologist. All I would say is that we must be careful not to sacrifice our patients on the altar of science. We are being urged to do it all the time. For instance it has been asserted that the after-results in cases treated by means of insulin or other shock methods are better than in those who have made a spontaneous recovery, and that statement is based on the suggestion that the former method is so much quicker, and anticipates emotional deterioration. Again, Freeman and Watts (*Journal of Nervous and Mental Disorders*, **105**, 3, March, 1947) say: "The main indication for psycho-surgery is emotional tension that is of great severity, threatening the patient with disability and suicide, and for which no other treatment is effective—it seems to matter very little what the diagnostic label is, or how long the tension has been present. Since certain patients, particularly schizophrenics, seem to lose their tension relatively easily, it is wise not to wait too long in the expectation that improvement will occur through the process of emotional deterioration." I maintain that here again we are meeting with advice and argument which is tendentious and dangerous. On the one hand we are urged not to bother too much about clinical diagnosis but to act quickly, even precipitately, and rather to have the betterment occur through the emotional deterioration produced post-operatively than by natural and spontaneous means. If I could gauge the recovery, even with a certain amount of emotional blunting, of a schizophrenic or any other type of case, I would prefer that situation to one produced artificially by operation. In connection with the above arguments I have been impressed by Salzman's paper on Evaluation of Shock Therapy (*American Journal of Psychiatry*, **103**, No. 5, March, 1947), when he points out that too little stress has been laid on the possible deteriorating effects on the personality of the individual. We should, he says, distinguish between the immediate remission rate and the long-term result, and in support of his argument quotes the results of Rennie and Ebaugh. Rennie reported that the remission rate in dementia praecox dropped in $3\frac{1}{2}$ years from 55 per cent. to 32·8 per cent., and in manic-depressives in the same period from 75·5 per cent. to 55·8 per cent. Ebaugh using insulin noted a remission rate fall from 63·5 per cent. to 48·2 per cent. in one year.

Salzman also draws attention to the very high readmission rate in patients who have been treated with shock treatment, and believes that this finding largely nullifies the conclusions expressed by others in relation to the economy effected by such treatment. Of 152 patients readmitted to St. Elizabeth's Hospital, Washington, 44 dementia praecox patients had received shock treatment and 45 had not. In the shock-treated cases the average readmission interval was 1·6 years, whereas in the non-treated cases the average readmission interval was 4·5 years. Thirty manic-depressive patients had received shock treatment and 33 had not; the former showed an average readmission interval of 1·4 years, while in the case of the non-shock treated cases the interval was 4·36 years. His general conclusion was to the effect that the larger the number

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of shocks the earlier the readmission. Whether or not you agree with Salzman's findings, you will no doubt be impressed by the fact that there is very little justification for the unnecessarily early and sometimes even precipitate and indiscriminate use of shock methods.

For my part I can say that Salzman's experience and results confirm the impression we have formed at Morningside. We have always maintained the necessity of great care in coming to an accurate clinical diagnosis; sufficient time to allow of spontaneous recovery, irrespective of the difficulties of management; careful evaluation of the amount of treatment given; and cessation of treatment as soon as an adequate result has been obtained, rather than pursue it needlessly in the false hope that by giving more treatment the recovery will be made more secure. If we do not obtain a result with the maximum number of 12 shocks we discontinue it, and have recourse to more pedestrian methods.

And now again, if I have not side-tracked the issues too far, let me return to the more specific consideration of leucotomy, of when and how to use it, of its contra-indications, and of whether or not it is completely justifiable. These considerations are based on experience with 100 cases which were operated on by Mr. George Alexander, Senior Surgeon to Mr. Norman Dott's neurosurgical unit. It is not necessary for me to review the literature because I realize that it is very familiar to most of you, but in passing I would merely like to say how striking and impressive it is. The reports of Ziegler, Freeman and Watts, Cunningham Dax, Cook, Frank, Ström-Olsen, Hutton, Golla, Berliner, Moore, and a number of others plus the comprehensive survey by the Board of Control tell a most wonderful story, and must carry conviction to everyone except the hopelessly prejudiced.

The criteria which I have utilized in coming to an opinion as to whether or not such an operation was justifiable are as follows:

1. Duration of the illness.

2. Degree of tension or affect.

3. The seeming impossibility of obtaining betterment by any other means.

In the discussions I had heard in relation to this operation, previous to adopting it, I had not been impressed either by the results or by the type of patient selected for such treatment. I was extremely sceptical regarding the advisability of carrying out a blind operation on a delicate structure such as the brain in the hope that the personality of a distressed, disturbed, aggressive, deteriorated patient could be re-integrated. It was not long, however, before I became completely converted, and recognized that a change and betterment could be effected which surpassed my wildest dreams and expectations. My "disinterested intellectual curiosity" was satisfied, and has remained satisfied ever since. Let me record our results quite briefly and summarily and then discuss certain salient features:

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TABLE I.—*Results in* 100 *Cases.*

Diagnosis.	Social Recovery.	Improved.	Unchanged.	Died.	Total.
Schizophrenia	12	20	18	1	51
Paranoid states	9	11	2	1	23
Involutional melancholia	6	2	—	—	8
Obsessional neurosis	7	1	—	—	8
Psychopathic states	—	3	1	—	4
Manic-depressives	1	2	—	—	3
Agitated depression	1	—	—	—	1
Mental defect	—	1	—	—	1
Encephalitis	—	—	1	—	1
	36	40	22	2	100

Apart from any personal comments which I might care to make regarding the transformation which has been effected in the above disturbed, distressed and often violent patients, whose illness had in the majority of cases been of many years' duration and appeared intractable, I would prefer that you should listen to extracts from a number of letters which I have selected from those sent by grateful relations.

1. " I am very happy to report that things have been going considerably better than my wildest expectations. My wife has been absolutely normal in practically every respect. She is happy as the day is long. She has much improved in her interest in the children, and her general attitude to them, though she is still a bit sharp with them on occasions. She gets on well with the household staff and has worked in very well with our new Nanny. She is now much more normal when meeting strangers than she was when she first came home, and in fact in every way it is possible for me to give a most excellent report. I cannot start to put into words what all this has meant to me."

2. "After her long illness I am very pleased to inform you that my sister is doing very well. She is living in her own home with her daughter. She attends to all her household duties, conducts all her own business personally, converses freely, and takes an interest in the daily news. She does her own shopping and understands the ration books."

3. " My son has kept well since he left Craig House in May, 1946. He has been doing horticultural work for four or five months and has settled down to it well. None of his bad symptoms have reappeared, though sometimes he is a bit forgetful. He is still somewhat solitary in his habits, and in regard to strangers is inclined to be shy."

4. " I am happy to say my daughter is keeping very well, and since she was discharged from the institution she has never looked back. If you care to see her I could bring her in any day any time to suit your convenience (Monday excepted) as she is being her sister's bridesmaid on that date."

5. " I am very glad to say my sister is now quite normal. She is just her old self again. She can go to her bank in a taxi alone and draw a cheque, also she can go shopping alone, and sometimes she goes for a walk by herself and enjoys it immensely. She takes an interest in the domestic affairs of the house, and also she has planted bulbs and plants in our garden here—she is very interested in gardening.

" She is gracious and delightful with friends, she is very pleased to see them and gives them a charming welcome. She loves going for a car run into the country. No one ever had a more loving or a more devoted sister, and so far she is so very, very happy that it is a joy to see her."

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6. " My daughter is very well. I rang up the family doctor to tell him of your letter and he replied : ' Tell him that I think her case remarkable, and that she is perfectly normal in every way.' I certainly say so also. She is just quite normal. She is the greatest help—takes an interest in the house, garden, and chickens, and does my shopping. She knits, sews and reads. I noticed that she got interested in papers and books gradually after being home for some time. She has been of the greatest help to her nephew, a boy 1½ years old—took him out each day, and often took him entirely out of his mother's hands."

7. " In my opinion my daughter's operation was a most wonderful success. She is now physically strong, and with regard to her mental condition I have not perceived any abnormality whatever. She is attending a training college with a view to becoming a teacher, and has been taking part in short spells of practical teaching. There are, of course, certain traits in her behaviour which a critical observer might find fault with—untidiness and a tendency to ingratitude and expecting everyone to serve her (but these showed themselves before her illness), excessive cigarette smoking, which might indicate a certain lack of self-control. But she is now 27 years old, and if at the close of her present training she is able to stand on her own feet, I think she will gradually correct and overcome these faults. I, personally, am deeply grateful to you."

I have in my possession many other letters of much the same tenour, and they all amply demonstrate the great benefit which has been effected so far as the patient is concerned, and the immense relief and gratitude of the relatives. Even in those cases in which social recovery and discharge cannot be related, yet the improvement in certain cases has been so extraordinary that numerous patients are now able to lead a life of usefulness and contentment under hospital conditions which formerly was denied to them. I shall content myself by giving two instances :

1. A young man, 28 years old, was admitted on 11 June, 1942, to the Royal Edinburgh Hospital for Nervous and Mental Disorders. He was regarded as a mental defective who had exhibited violent and dangerous propensities. A short summary of his life record is as follows :

He was educated in an Industrial (Approved) School to which he had been sent for stealing. After leaving the Industrial School at the age of 16 he was found, on account of his impulsive conduct to be unemployable. When 19 years old he was charged with attempted bag-snatching and was put on probation for one year. A few months later he broke his probation and was fined 10*s.* or 5 days' imprisonment. During the same year he was charged with theft and was sentenced to three years' Borstal treatment. While there he was described as impulsive, destructive, mendacious, a runaway.

When 20 years old he was considered unsuitable for Borstal treatment, was certified as a mental defective, and transferred to an appropriate institution.

During the following years his conduct is described in the following terms : Very violent, aggressive and destructive, constantly provoking other patients ; on one occasion leapt through a stair-case window. At times he appeared to be hallucinated and delusional ; he attacked several patients and attendants ; he required constant supervision and sedative therapy. In April, 1942, he made a sudden, vicious, homicidal attack on a fellow patient with a pick-axe. That incident was reported to the Procurator-Fiscal, and the Crown authorities recommended his certification as a person of unsound mind.

From June, 1942, until July, 1945, when leucotomy was performed by Mr. George Alexander, he continued in a violent, destructive, unco-operative state. He was frequently controlled by restraining sheets and by almost continuous sedation.

Following the operation he co-operated well in his treatment, did not interfere with the head dressing, and eventually allowed the sutures to be removed without demur. Seven days after the operation he was reacting to auditory hallucinations ; he said that " voices " spoke to him, that people were trying to make a fool of him

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and that he was being encouraged to smash things up. He managed, however, to maintain his self-control.

Since that time he has maintained a continued improvement. He is happy and biddable, he is friendly with his fellow-patients and the staff, and he is proving a useful member of the garden staff.

2. A young man, 26 years old, was admitted in August, 1945, to the Royal Edinburgh Hospital for Nervous and Mental Disorders. I had been interested in this young man for approximately nine years, as I had seen and examined him on numerous occasions at the instance of the Procurator-Fiscal. He had been charged repeatedly for lewd practices towards young children. On occasions he had served a prison sentence, but on other occasions he had been a patient in a mental hospital, either voluntarily or under certificate.

He came from a poor stock; he had a fractured skull when seven years old, and a year or two later contracted a severe attack of scarlet fever with subsequent cardiac involvement. He had, however, made good progress at school, he was of average intellectual attainment, but his work record had been deplorable. He changed from job to job largely on account of his aggressiveness and bad temper. At home he was threatening towards his family, and on many occasions vowed that he would injure himself or others. I had many talks with him, during which he expressed great remorse for his conduct, but he felt that he was completely controlled by his over-mastering impulses, and he pled repeatedly that some course should be taken so as to assist him to modify and control his conduct in the hope that he would cease to be a public nuisance.

Eventually, after much thought, I decided to recommend a leucotomy, and this was performed in December, 1945.

Following the operation he was confused, out of touch with his surroundings, interfered with his bandages, was incontinent of urine and faeces. He took longer than usual to convalesce from the operation, and it was not until 16 days after it that he was able to co-operate satisfactorily in an examination. He has not recovered from the point of view of earning his living or of being independent, but he has become a quiet, steady patient who has been freed from impulsive outbursts and has been able to work industriously in the Occupational Therapy Department. He has far greater confidence in himself than formerly, and eventually it may be possible to sanction his discharge in the hope that he will be better able to restrain his sexual impulses than previously.

There are many other cases which I would like to discuss and draw attention to, but I have picked out those two cases purposely because they illustrate the difficult question of how and where mental deficiency, psychopathy and insanity end and where delinquency and criminal conduct begin. The results obtained by means of operation have been most impressive, because a state of peace and relative contentment has replaced one of turmoil and discontent. The suggestions which arise in my mind as a result of my experience with those two cases have taken this form:

1. Would not many delinquents, who realize how unhappy and unsatisfactory their lives are, not readily accept this form of treatment in the hope that they would be greatly benefited?

2. Do such results not constitute a strong argument towards the adoption of a strong psychiatric service in our prison system?

3. Would it not be possible to suggest to the Legislature that sufficient evidence has now accumulated to enable us to recommend leucotomy in certain cases, not as an alternative to, but as an adjunct to prison treatment?

4. Would the psychotherapy of the delinquent not be more effective and satisfactory once a leucotomy, in certain selected cases, had been carried out?

No doubt others might formulate other and better questions along similar

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lines, and if this were done, would they not constitute a valid reason for medico-legal discussions in which the arguments, *pro et contra*, could be seriously canvassed? It would, of course, be at once suggested that there might be cases in which the patient's conduct had been aggravated rather than helped by the operation, and while there may be such individual instances, yet I believe, from my experience, that they are comparatively few in number; in any case, both mental hospital and prison treatment by themselves not infrequently lead to considerable deterioration. I feel convinced that any fair-minded person, whether judge or physician, with the interest of the individual and the welfare of the public at heart, might welcome the suggestion I have made.

In addition to what has been said there are a few other points which I would like to draw attention to.

The mere statement of discharges and improvements, wonderful as the figures are, does not do full justice to the results obtained. It cannot be too strongly emphasized that the vast majority of the cases operated upon were persons who had had every conceivable form of treatment previously, whose illness had been of a prolonged and desperate nature, and where a good result, judging from one's past experience, had seemed impossible. In contrast the results have been far beyond my expectations, and have convinced me that in suitable cases the operation of leucotomy is not only justifiable, but advisable. Our mortality rate has been 2 per cent., our post-operative epilepsy rate has been approximately 7 per cent., but the epileptic manifestations have been very infrequent and episodic, and have not given cause for any alarm.

Our figures show one interesting contrast. In the Royal Edinburgh Hospital we have separate departments, Craig House and West House, which cater for people in a somewhat different social and economic position. At Craig House we have the patients able to afford the higher rates of board, whereas at West House we have a number of rate-aided patients and those paying relatively small rates of board. At Jordanburn Hospital we deal only with psychoneurotic cases. Table II illustrates the results obtained in the different departments:

TABLE II.

	Discharges.	Improved.	Unchanged.	Deaths.	Total.
Craig House	24	13	7	1	45
West House	10	27	15	1	53
Jordanburn	2	—	—	—	2
	36	40	22	2	100

It is, of course, obvious enough that we should not read too much meaning into the above results, but the far greater discharge rate among the Craig House patients is very striking; it may be that those with rather better social, intellectual and economic resources have the more satisfactory prognosis.

Another contrast which is worth commenting on, and which I have not seen especially mentioned, is that existing between men and women.

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TABLE III.—*Results in Men and Women.*

	No.	Discharges.	Improved.	Unchanged.	Deaths.
Men	53	15	21	15	2
Women	47	21	17	9	—

The larger social recovery rate in the case of women is quite marked, and is what might be reasonably expected, because tension states are rather more frequent and severe in them than in the case of men.

Leucotomy has now been given so extensive a trial in so many hospitals and clinics that I believe the time has come when it should be utilized in suitable cases, but always with great discrimination, and not in any spirit of merely giving the patient a chance. The chance should be based on accurate clinical diagnosis, on a careful study of the literature, and in the belief that, despite the severity and duration of the illness, sufficient of the personality has been left intact so that a reasonable reintegration may be expected. That would seem to be an infinitely safer plan than to attempt to proportion the extent of the operation to the severity of the clinical state as Freeman and Watts have suggested. In consequence all the cases presented in this series have been subjected to the closest clinical scrutiny, and I have come to agree with the view expressed by Frank (*Journal of Mental Science*, 1946) that leucotomy is contra-indicated in cases of schizophrenia with a shallow affect and an insidious development. I would, however, enlarge that category, and would suggest that all cases immature or lacking in emotional development, the constitutionally loaded, the chronic invalid reaction types, are those in which a satisfactory result can hardly be expected. A man, whom I saw originally in 1938, who took an unfavourable view of his prospects, was given intensive courses of insulin coma, cardiazol, electric shock and then, following a leucotomy, he took his own life because he believed that he would never regain a sense of confidence and efficiency, and because he believed that all forms of treatment had been exhausted. In my opinion he was the type of person who would have been more satisfactorily dealt with by constant and persistent encouragement and reassurance rather than by any form of physical treatment. I have mentioned the case to serve as a warning, and as a plea for the greatest discrimination in deciding for and against operation. So far as our cases of schizophrenia have been concerned, practically all those in whom a favourable result was obtained were cases in which exogenous etiological factors had been prominent, and in which a considerable paranoid colouring was present. It was not sufficient to warrant a transfer of the case to the group of paranoid states, but it was sufficiently prominent to remind one of the abortive paranoiacs of Friedman and Gaupp, of the querulants of Specht, and of the periodic paranoid states of Bleuler. Such symptoms may be pointers to more intensive and accurate diagnostic analysis. I feel perfectly certain in any event that the majority of conditions formerly known as paranoid schizophrenias should be regarded as paranoid states purely, and not necessarily related to schizophrenia at all; many of them have a much closer affiliation to manic-depressive episodes than to schizophrenia. I consider that our results with paranoid, involutional, and obsessive states have been outstandingly good.

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There are many other points which could be discussed in detail, and where perhaps one might take a rather different view-point than has been expressed by others, but this is not the time or the occasion to be controversial, and there is still so much unknown that it is wiser not to be dogmatic, but rather to recognize that it will take many years yet before we have accumulated all the information to enable us to come to clearer and better formulations. I at least am satisfied from my personal experience, and no one can rob me of it, that in leucotomy we have a means of benefiting many persons to such a degree that, irrespective of a failure here and there, a great advance in the treatment of otherwise intractable conditions has been effected. It may be quite true to argue that the hypothesis which has led to any of those forms of physical treatment in which such magnificent results have been obtained is faulty, but it should likewise be remembered that it was while acting on a wrong hypothesis that Columbus discovered America. Taking everything into consideration, I will feel infinitely more satisfied by my contribution to psychological medicine if I can continue to promote results and recoveries on a faulty hypothetical basis rather than remain inactive because of it, but the matter cannot be left there.

We must continue to strive for greater accuracy, for the closer approximation of hypothesis and practice. That, however, does not alter the fact that I believe that medicine is largely empirical. There is nothing antagonistic between the science of medicine and empiricism, because empiricism (meaning experiment, experience) must always act as a stimulus to more research and investigation. Whether the practice of medicine will ever become an exact science is extremely doubtful. There are too many variables, and every person is, more or less, a law to himself. It is for that reason that in the practice of our art we cannot afford to wait until scientific theory and fact have been established. Indeed Dyce Duckworth (*International Clinics*, **4**, 1911) once stated that he believed that the public, in certain instances, prefer the medical artist to the medical scientist, and he added: "There must be good reasons for this preference." Let us therefore not frown on, but ardently encourage the development of that intuitive judgment which Dr. John Brown called the "Nearness of the Nous" or presence of mind; it is, I believe, a more valuable asset in the understanding and treatment of our fellow citizens than intellectualism, logic and rhetoric.

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PSYCHIATRIC DISORDERS AMONG THE CHRONIC SICK IN HOSPITAL.*

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Introduction.

The Admission of Aged Psychiatric Patients to Institutions.

It has recently been pointed out (Lewis, 1946) that between the years 1907 and 1937 the number of first-attack admissions of patients of 65 years and over, into the mental hospitals of England and Wales, differs considerably from analogous American figures. In Britain, using statistics supplied by the Board of Control for England and Wales, there was a marked tendency for the incidence of this group to decline, whereas in America, using statistics from New York Mental Hospitals Board, there was a marked increase. An explanation is found in the assumption that in England large numbers of cases which would be relevant to the statistics, were looked after in other institutions or at home, whereas in America less alternative accommodation was provided. It is doubtful, had the investigation been continued up to the present date, if the statistical divergence would have been found to continue. The incidence of first-attack admissions of those over 65 has, of course, a more subtle significance than a simple admission-rate for an age-group, or even a first-admission-rate, but the present impression in British Mental Hospitals is that admission of old persons—even first-attack admissions—has increased, especially during the war years. Post (1942) demonstrated this rising incidence of aged patients by analysing the admissions to Edinburgh Royal Mental Hospital from 1904 to 1942.

The number of aged and long-term sick suffering from either physical or mental disorders who could be looked after at home during the war years was much reduced by the mobilization of the female sex for war work, and the number who could be attended in nursing homes and local hospitals was also reduced by the recruitment of nurses for the armed forces. The hospitals, too, suffered reduction in numbers by being reserved for emergency purposes and by war damage. The result has been that British mental hospitals have been asked to find accommodation for many older persons who in pre-war days would have been nursed elsewhere. These changes occurring since 1937 support Lewis's explanation of the statistical differences between the two countries' 1907–1937 reports. Lewis suggests that the bulk of the patients not accounted for in the British statistics were to be found in the Public Assis-

* A paper awarded the Bronze Medal for 1947 by the Royal Medico-Psychological Association.

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tance Institutions throughout the country. This he has confirmed by superficial clinical observations and by reference to the London County Council's statistics for these institutions. In the year 1932 roughly 28 per cent. of the cases in what used to be called the "workhouse" were mentally disordered, and about 12 per cent. were labelled "senile dementia." These patients were outwith the inspection and statistical investigation of the Board of Control.

The account which follows gives some clinical details of the cases found in some equivalent modern institutions for the chronic sick and demonstrates a higher incidence of mental disorders than the figures mentioned.

The Type of Hospital Investigated.

The advent of the Local Government Act (1929) removed the term "workhouse" and brought the institutions so-called from the control of the "Boards of Guardians of the Poor" into the hands of the Public Assistance Committees of the Local Authorities. The buildings consisted usually of casual wards with arrangements for work, the "house" which had sitting and sleeping accommodation with airing and exercise courts, and the infirmary for the sick and bedridden. The officials were the Master, the Matron and the Medical Officer. Apart from the labour arrangements for casuals, many institutions still remain organized in this way, while others have evolved to a varying degree. Some authorities have increased the hospital accommodation by taking over all the buildings for the treatment of the sick, while others have gone a step further and passed the institution over to the Public Health Committee for management. No matter whether governed by the Public Assistance (now in some cases the Social Welfare Committee) or by the Public Health Committee, these buildings have generally been adapted and altered, though not always satisfactorily, into hospitals which house for the most part chronic sick medical cases. Any new building has usually been used for acute and maternity work.

The changes in the name and management have, in some cases, been followed by a high standard of medical work and care, but the Regional Hospital Surveys (1946) have revealed great deficiencies both in the accommodation and services provided throughout the country for chronic sick people. It is easily confirmed that large numbers of psychiatric cases occur in these hospitals, though arrangements for them as such are rarely undertaken. The result in some instances is that in the same ward cases of chronic heart failure, rheumatoid arthritis, senile dementia, diplegia with congenital deficiency and even relatively healthy, but paranoid personalities are to be found. The physically ill are therefore subjected to added mental discomfiture and the mentally ill do not obtain the investigation and facilities which are due to them. It is only just to remark here that the Regional Surveyors also recorded instances in which ample and good provision was made for the chronic sick.

Procedure of Investigation.

A survey was undertaken to discover the proportion of the various types of physical and mental conditions found among the chronic-sick patients who were to be found in a group of institutions supplying the hospital accommodation

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for this type of case in a city of 500,000 inhabitants. It was anticipated that recommendations for changes in management and conditions for the patients would materialize from a study of the information obtained.

Patients were examined in five hospitals (825 beds) governed by the Local Authority Public Health Committee which was progressive in its views. Three of the hospitals admitted chronic-sick only, while others contained maternity and tuberculosis beds in addition. Psychiatric cases were not admitted as such, though aged persons were not refused admission because mental symptoms were included in their ailments. A total of 788 patients were examined. In each case sociological, physical and mental aspects were investigated. The patient was examined physically with a view to finding the extent of the functional incapacity in relation to sight, speech, hearing, walking, etc., and the underlying disease. A psychiatric examination was undertaken to estimate the mental dysfunction and any individual peculiarities which might have a bearing on the nursing of the patient. Information was available from the patient's records and from the nursing staff, who were able to give an account of the patient's behaviour over a long period in most cases. An account of the findings of the survey has been published (Affleck, 1947) in which it was demonstrated that central nervous system lesions, senile weakness, arthritis and chronic bronchitis were the most numerous physical conditions accounting for the patient's admission to hospital. In the social aspect, widows and single people predominated and home and family disruption by war-time events were frequently encountered. A more detailed analysis of the psychiatric findings is now presented.

Psychiatric Findings.

A. *Incidence.*

1. *General.*—37·3 per cent. of 788 patients examined (552 women and 236 men) had some form of mental disorder. The sexes were nearly equally affected. The incidence in the main age-groups is shown in Table I.

Table I.—*Total Patients and Incidence of Mental Disorder.*

	Number.	Total. Per cent.	Male. Number.	Male. Per cent.	Female. Number.	Female. Per cent.
Among all patients	294/788	37·3	92/236	38·9	202/552	36·6
,, those over 65	221/628	35·2	68/183	37·1	153/445	34·4
,, ,, under 65	73/160	45·6	24/53	45·3	49/107	45·8
,, ,, 45–65	62/116	53·4	21/43	48·8	41/73	56·2
,, ,, under 45	11/44	25·0	3/10	30·0	8/34	23·4

It will be noticed that the average age of the patients is very high, and that only about 20 per cent. are under 65. Perhaps the most interesting superficial observation is the high incidence of cases of psychiatric interest among the younger classes of patient. In the 45–65 years' group more than 50 per cent. show mental symptoms—a much higher proportion than among the aged, though the numbers involved are relatively small. Moreover, in many cases ascribed to the older groups the patient had been in hospital for several years

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and in some the disease might be regarded as attributable to the earlier period.

2. *Age-group "under 45."*

Total chronic sick	44	(males	10,	females	34).
Psychiatric disease or complication	11	(,,	3,	,,	8).
Mental defectives	5	(,,	2,	,,	3).
Presenile dementia	5				
by disseminated sclerosis	3	(,,	2,	,,	1).
by epilepsy	2	(,,	1,	,,	1).
Hysteria	1	(,,	—,	,,	1).

Five patients were congenital mental defectives with gross physical incapacity and might have been found in any institution for defectives.

From a total of 7 cases of disseminated sclerosis, 2 cases showed obvious symptoms of organic brain involvement to the extent that they were unable to converse properly or take part in any communal entertainments or functions, and another showed a marked depressive apathetic reaction.

There were two epileptics in whom dementia had progressed to an obvious stage and a youth who suffered from very extensive poliomyelitis had hysterical spasms.

3. *Age-group 45–60.*

Total chronic sick	116	(males	43,	females	73).
Psychiatric disease or complication	62	(,,	21,	,,	41).
Presenile dementia	36	(,,	11,	,,	25).
Primary	5	(,,	3,	,,	2).
Secondary	31				
By arteriosclerosis	21	(,,	6.	,,	15).
,, disseminated sclerosis	2	(,,	1,	,,	1).
,, bulbar palsy	1	(,,	—,	,,	1).
,, cerebral tumour	1	(,,	—,	,,	1).
,, epilepsy	5	(,,	1,	,,	4).
,, myxoedema	1	(,,	—,	,,	1).
Taboparesis	4	(,,	4,	,,	—).
Hysteria	1	(,,	—,	,,	1).
Mental defectives	20	(,,	9,	,,	11).
Paraphrenia	1	(,,	—,	,,	1).

The incidence of mental disorder in this group of the chronic-sick was very high (53 per cent.), though it was raised artificially by the presence of 10 patients whose disease was primarily mental and required no physical nursing. These were 5 cases of primary presenile dementia, a paraphrenic who was subsequently transferred to a mental hospital and 4 mental defectives who were able to be up all day.

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4. *Age-group* 65 *and over.*

Total chronic sick	628 (males 183, females 445).
Psychiatric disease or complication	221 (,, 68, ,, 153).

This group of chronic-sick comprised 79·7 per cent. of all the patients. Almost 30 per cent. of them were over 80.

The differentiation between senescent deterioration and senile dementia is a matter of individual judgment. Howell (1945) has made use of the term "normal senile mentality," which presumably is intended to indicate a certain degree of forgetfulness, emotional restriction and narrowing of interest, though some aged people are found in whom it is not possible to detect changes of this kind. From the point of view of "personality," however, such findings are disorders. They indicate a pathological change in the function of the mind, even though it may be argued that its basis is physiological and inevitable. Patients showing these symptoms might reasonably have been called "simple senile deterioration" and added to the total of mental disorders, but for the purposes of this investigation when only these traits were present, they were recorded under "forgetfulness" as a separate category. There were 86 patients (37 males and 49 females) in this group. Only those who gave the impression of a definite organic type of reaction were included under the term "senile dementia." The statistics for this age-group were:

Senile dementia	167 (males 44, females 123).
Including arteriosclerotic symptom types	55 (,, 16, ,, 39).
Paranoid states	22 (,, 10, ,, 12).
Depression	18 (,, 3, ,, 15).
Senile hypochrondriacal obsessions	4 (,, 3, ,, 1).
Anxiety states	6 (,, —, ,, 6).
Hysteria	1 (,, 1, ,, —).
Mental deficiency	3 (,, 1, ,, 2).

These patients had been admitted owing to physical dysfunction associated with cardiovascular degeneration, cardiac failure, hemiplegia, senile Parkinsonism, bronchitis, arthritis, fractured femur and other disorders of the senile period.

B. *Clinical Types.*

1. *Organic reaction types.*—80 per cent. of the psychiatric cases had an obvious organic element in the aetiology of their disorder. As there is a natural tendency to assume that senile dementia covers the complete scene in a population of this type, Table II is inserted to demonstrate the statistical relationship between this disorder and the other groups.

TABLE II.

	Number.	Total. Per cent.	Male. Number.	Male. Per cent.	Female. Number.	Female. Per cent.
Total senile dementia	167	—	44	—	123	—
Of all patients	167/788	21·2	44/236	18·8	123/552	22·3
,, mentally disordered	167/294	56·8	44/92	47·8	123/202	60·9
,, organic dementias	167/232	71·6	44/65	67·6	123/167	77·2

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The type of senile dementia chiefly encountered differed from that generally admitted to mental hospital. The quiet, apathetic, disinterested, disorientated and incontinent types resembled more the terminal states of G.P.I. than presbyophrenic states. These apathetic states comprised the great majority of the cases, but restless ones also occur and are nursed in cot beds. The clinical types associated by Howell (1945) with progressive cerebral ischaemia appeared to occur frequently. After a period of varying length in which forgetfulness and the minor traits of simple senile deterioration are obvious, the patient enters a hyperactive episode with confusion and restlessness by day and night. This is soon followed by stuporose and then comatose states. The whole sequence may cover a period of two or three months and it is suggested that the stages represent cerebral, thalamic and medullary ischaemia. It may be that this disease sequence is seen more completely in the chronic-sick wards than in mental hospitals, where admission is delayed until the second stage. Howell does not regard all restless patients as included in this pathological classification, but asserts that the syndrome is a terminal one and should be recognized as such. The high death-rate occurring among patients admitted to institutions because of senile restlessness is a constant finding. Even taking into consideration the exhaustive factor, the weakness attributable to age and the liability to broncho-pneumonia, it seems reasonable to regard these states as a signal of a failing circulation rather than as having origin in the brain only. Rothschild's work (1942) on the relationship between heart size and the effect of cerebral lesions tends to confirm this. He found that patients who had had milder cerebral symptoms had post-mortem evidence of cardiac enlargement which appeared to have offered some "compensation" to the cerebral circulation.

Functional elements may complicate cases of apparent senile dementia. Sometimes it seems that the apparent loss of memory and disorientation may be at least partly due to inattention and hopelessness, and to the effects of poor perception by partial blindness or deafness. A withdrawal of interest may also occur in response to the popular attitude that old people should not interfere with the interests of others. Some families may hasten the onset of maladjustment in their parents by the habit of withholding information from them. Admission to hospital is, in some quarters, used as a threat towards the aged, who, in the opinion of their families, tend to interfere and it is not surprising that on admission to hospital they believe that they have been "put away" and react to this in the way they feel appropriate. To be ill and require hospital attention is regarded by some as in itself a severe blow to self-esteem and such readily develop abnormal responses which modify their symptoms and, it is possible, accelerate the senile deterioration.

The chief presenile organic reactions also differed from the usual mental hospital types in their quiet uninterrupted apathy. Primary presenile dementias were not typical of the Alzheimer or Pick's types, though further physical and sociological investigation would have been required for accurate diagnosis. Secondary presenile dementias had usually gross physical incapacities and ample evidence of the physical factors in aetiology. Among the true chronic-sick in the physical sense the psychiatric complication most frequently met was a secondary presenile dementia following high blood-pressure and

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hemiplegia. These patients showed emotional lability and inability to concentrate which appeared to lead to disorientation for time and progressive apathy. A high proportion of those suffering from tabes or taboparesis were predominantly apathetic and disorientated, though one had marked paranoid ideas without dementia. Other secondary presenile dementias occurred in association with disseminated sclerosis and bulbar palsy, cerebral tumour, epilepsy and myxoedema.

2. *Depressive reaction types.* (18 cases).

Involutional melancholia . . .	2 (males —, females 2).
Depression with organic reaction . .	8 (,, 4, ,, 4).
Reactive depression, pathological . .	8 (,, 3, ,, 5).
,, ,, not pathological .	Not enumerated.

There were two cases of involutional melancholia, one of whom had an old hemiplegia. The other had previously been in a mental hospital and was retransferred with a view to treatment.

Other cases in which depression was the most outstanding symptom occurred with organic senile states with marked physical symptoms, but the majority could be classed as reactive depressive states. For statistical purposes only those which were judged to be beyond reasonable bounds in degree or duration were accepted. Such mental conditions were accompanied by self-centredness, pessimism, apathy, anorexia, fatigue, insomnia and visceral disturbances and preoccupation with the effects of the concomitant disease or the distressing aspects of the hospital life.

There was a high incidence of reactive depressions of a type which could not be regarded as psychotic, nor even neurotic, but were the response to being both old and sick at the one time. In this state the outlook may appear hopeless and effort futile. Such states are often based on false assumptions and may be relieved with a little medical explanation, guidance and encouragement. This is obviously so much due to the patient that one hesitates to call it psychotherapy.

Suicidal attempts are not frequent in these wards, where physical handicaps are usually severe, but such incidents have occurred in the hospital history of a few of the patients examined. It seems extremely important that diversional occupational therapy, books, radio and other stimulating activities should be provided to a maximum for these patients and that visitors and voluntary workers should be encouraged to come and increase the quota of interest in the environment. Further therapy is usually excluded by the physical state, though, alternatively, an improvement in this sphere may contribute materially to the relief of mental symptoms.

3. *Paranoid reaction types.* (23 cases).

Paraphrenia (physically well) . . .	1 (males —, females 1).
Paranoid states with organic reaction .	14 (,, 3, ,, 11).
,, ,, without organic reaction	8 ,, 4, ,, 4).
,, ,, with associated deafness	7 (,, 3, ,, 4).

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These were generally found among the old people and were philosophically accepted by the nursing staff (who had no mental training) as merely an example of the way people became " queer " in later life. In some cases hallucinations were present and the patient would see " lights " or " figures " or reply to " voices " quite obviously. The more common situation, however, was one in which the patient was reserved and quietly suspicious of the staff and other patients, and periodically expressed offended pride or made unjustified accusations.

Partial or severe deafness was a frequent accompaniment of these conditions. Such handicaps reduce the capacity to communicate with others and readily give rise to misunderstandings, which are initially genuine, but if not corrected, may result in unnecessary hostility. The result is that the patient is prepared to believe the worst of his attendants and elaborates their misdeeds as a function of his resentment. Perhaps jealousy of youth and vigour may contribute to the disorder in certain personalities, especially if insufficient sympathy and attention is accorded to reminiscences or other compensatory mechanisms.

4. *Neuroses.* (13 cases).

Hysteria	3	(males 2,	females 6).
Anxiety states	6	(,, —,	,, 6).
Senile hypochondriacal obsessions .	4	(,, 3,	,, 1).

One case of painless facial tic occurred in a patient suffering from chronic bronchitis. Another younger patient had hysterical movements of the limbs. These occurred on commencing to converse with a stranger, but were less obvious once acquaintance was established. The habit had been present for many years and the patient was a helpless cripple from anterior poliomyelitis.

A case of paraplegia, aged 50, was admitted at the urgent request of the Relieving Officer, as some of the neighbours, by whom she had been looked after for some months, had reported the unsatisfactory circumstances. As the history of previous attacks was given along with a diagnosis of disseminated sclerosis the usual screening at the acute hospital was not carried out. Personal history and a thorough physical examination, however, cast doubt on the diagnosis, and adequate power was found on examination of the legs. Light hypnosis and persuasion over some weeks effected a symptomatic cure. The patient was in " reduced circumstances " and greatly resented having had to go out to work in later life after a youth of ease. Following a motor accident she had frequent illnesses during which her friends treated her with special favour without requiring her to accept money. She was not entirely without insight into the nature of her afflictions.

Chronic anxiety states were met in association with high blood-pressure and heart disease. The somatic component in the aetiology appeared to be so predominant that sedatives seemed justified as the therapeutic measure though two cases responded to psychotherapy to some extent.

Hypochondriacal obsessive states were not uncommon. Some were associated with depression, others with anxiety and some seemed to have a " conversion " basis. Fear of recovering to the extent of having to leave the

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hospital is not unknown among those old and infirm people whose discharge from hospital would mean renewal of a lonely struggle against cold and hunger. A well-meaning enquiry for symptoms in these cases meets with a ready response, though one does not readily diagnose malingering among creaking joints and atrophic muscles. When it is made clear that recovery may lead to a hostel with certain attractive features, however, a change of attitude is sometimes seen and the advantages and privileges of illness given up. Hypochondriasis in an old person may be based on a true physical dysfunction due to the atrophy of glandular and muscular tissue, which may be regarded as physiological in senescence. Changes in diet or eating habits or other modifications of routine may help to relieve this physical component of the condition, while on the psychological side a recovery of other interests may be helpful. In many cases, however, the Freudian explanation of the regression to " pregenital interests " will be invoked.

5. *Congenital Mental Defectives* (28 cases).

Imbeciles and high- and low-grade feebleminded types were found. Many of these cases are helpless invalids from diplegic or paraplegic disabilities, but others had been admitted with some transient or long-term illness after which their relatives had found it impossible to welcome them home. Of the latter, the high-grade types often help with some ward work and many have been in hospital for years, as they were admitted before admission to colonies with a view to training was regarded as important. One outstanding case of this type was a relatively high-grade young woman who suffered from recurrent intestinal obstruction due to Krohn's disease. She was an unstable person with recurrent depressions, but had been able to do a fair amount of domestic work. Eventually, in a depressed and suicidal state, she had to be admitted to mental hospital, where she died in a recurrence of the physical trouble. It was felt that she had missed the benefits provided by the Mental Deficiency Services, which might have increased her stability and confidence.

The Significance of the Findings.

It is impossible to consider the results of this inquiry, taken in conjunction with the reports of the Nuffield Surveyors, without criticizing the arrangement for the chronic-sick, in which it is possible to find a greater mixture of mental disorder than in a well-arranged mental hospital. It is clear that the present authorities responsible for these cases are blinded by the impression that a majority of the cases suffer from uncomplicated physical changes—and have failed to realize that psychiatric problems exist in these wards. Psychiatric specialist help is of definite value among these cases. They are looked after for the most part by nursing and medical staff who have little knowledge or interest in this type of disorder—not due to lack of personal qualities, but to the fact that few nurses or doctors are trained either among chronic-sick or psychiatric cases. The result is that violent or persistently annoying behaviour disorders are required before action based on psychiatric thought is taken and quiet patients are nursed with a view only to their physical needs. Admit-

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tedly the effect on most cases is not adverse, but when large numbers of chronic-sick are considered it is not difficult to discover cases in which advice on the mental state would have been of benefit or who should be nursed by mental-trained staff. At this time, when Regional planning seems likely to assist in breaking down the barrier between mental and physical ailments, it is important that the full needs of this class of patient should be taken into consideration

From the aspect of information and statistics it is obvious that in the hospitals for the chronic-sick throughout the country there exist large numbers of mentally-ill people outwith the purview of the Board of Control, whose reports are regarded as covering the field of psychiatric in-patient treatment in this country. The numbers in these hospitals must be much larger than any other group of uncounted mentally-disordered people. It seems reasonable to conclude that these people, to a large extent, account for the difference between British and American statistics relating to admissions to mental hospitals among the higher age-groups, to which reference has been made.

Management of the Chronic Sick with Special Reference to Psychiatric Aspects.

Types of Hospital.

Among the chronic-sick there is a variable, though relatively small percentage of younger people under 45 (12 per cent. in Leeds) suffering from such conditions as post-encephalitic states, disseminated sclerosis and other disorders of the C.N.S., chronic heart failure, rheumatoid arthritis, etc. Such cases are also found in the various privately-managed homes for cripples and incurables throughout the country. It is desirable that the younger age-groups should be removed from the ranks of the remainder of the chronic-sick. They should be provided with special long-term accommodation, including occupational activities, entertainment and diversional facilities, according to their needs and capacities.

It is to be expected that the term chronic-sick implies chronic-sick physical cases. Although the vast majority of the mental disorders among the chronic-sick are organic in basis, senile dementia is by no means the only form of mental illness which occurs. Thus, whether desirable or not, hospitals already exist in which are collected the organic reaction and senile types of mental disorder though, unfortunately, they are mixed among normal people. One of the first steps taken when an attempt is made to improve the conditions of the chronic-sick is the segregation of the psychiatric cases. The fear that nursing morale will fall, prevents most large authorities from following the lead of the London County Council in creating a special hospital for this type of case only. Such fears are not entirely unjustified. It would appear that before such an establishment can be successful, it is necessary that from the medical point of view the poverty in response from the patients should be offset by research activities and, from the nursing angle, that the institution must be sufficiently large to ensure that the admission- and discharge-rate is big enough to provide interest. These difficulties could also be overcome if, as suggested by Cunningham Dax and Reitman (1946), hospitals were estab-

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lished specializing in psychiatric treatment of the aged into which all types of behaviour disorders could be admitted. Among these, convulsive and other special therapies might be indicated. From the point of view of the chronic-sick, however, admission would have to be based more on clinical and social grounds than on a definite age-limit, as it has been demonstrated that a fairly large number of beds are occupied by cases of dementia occurring between 50 and 60 years.

It seems more desirable, however, that the older age-groups should be admitted to hospitals for the aged in which subdivision into medical and psychiatric types would be obvious and natural, and acute medical and surgical conditions could also be catered for. Such a service (which is analogous to the paediatric special hospitals) could be completed with out-patient facilities and social services. The geriatric hospital, it is therefore suggested, would provide the best solution to the problem of accommodating the chronic aged sick, and in it a certain proportion of mentally disordered patients would be expected.

It is desirable that the buildings provided for such a hospital should be adequately subdivided so that not only different medical, mental or surgical categories may be nursed separately, but some attention may be paid to the requirements of the patient's personality. The individual tends to be lost in large wards and to be tormented in small ones if the company is uncongenial. The aged have difficulties in acquiring new adaptations to changes in their surroundings and require as much individual attention as possible. Wards of 4 and 8 beds are the most acceptable size and their equipment should include adequate bedside lockers, screening arrangements and bed lighting. Special provision should be made for patients who are able to be up for part of the day. They require homely day rooms, hand rails and other aids to walking or wheel chairs. Verandahs or balconies are very desirable.

Medical Arrangements.

The geriatric hospital envisaged above would differ from the present chronic-sick type in that it would be attended by medical men of consultant rank, who would attend the acute and chronic wards. The success or failure of the therapeutic and research activities of the institutions would then depend on the interest or zeal of these individuals, but the classification of types of patient accomplished would in itself be a great help to the organization of investigations and the collection of statistics. The prospect of success in advancing knowledge of geriatric disorders would be infintely greater than now, when the chronic-sick wards, which are the equivalent at present, often have no specialist advice unless on rare occasions.

The chief clinicians attached to the hospital would be the physician, psychiatrist, surgeon, orthopaedist and ophthalmologist. The physician and psychiatrist would be responsible for the majority of the beds, but would frequently be required in all departments. The growing importance of the disorders of old age are well enough realized to make it possible to fill the resident post by medical men of " registrar " status interested in the research aspects

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of the work, and by others who realize that work among the aged constitutes a very large part of general practice.

Functions of the Psychiatrist.

(a) *Among the Chronic Sick.*

It cannot be reasonably expected that the relatively small number of psychiatrists at present available should be expected to devote much routine time to the chronic-sick. The increase in the amount of teaching on psychological aspects of medicine in the medical curriculum, however, should increase the impulse among those responsible for the management of these cases to classify them and insist on the provision of the facilities required for the various types. There exist, for example, hospitals without day rooms for up-patients, diversional activities, entertainments or facilities for physiotherapy—the lack of all of which may be an important factor in the life of these long-term and not necessarily incurable cases. In the meantime psychiatric knowledge and advice should be made available to all hospitals dealing with the chronic-sick to advise both on general and specific aspects of the cases. Such a service would improve the morale of the patients and act as a prophylactic in reducing the incidence of apathy and depression which is encountered, and would possibly result over the country in the investigation and treatment of many individuals.

(b) *In a Geriatric Hospital.*

The Psychiatric Unit in this type of hospital would often encompass a larger number of beds than any other single department. It could be run as an extra-mural activity of the local mental hospital by the seconding of junior medical staff for periods of months, and the extension of the senior staff consultant duties. Perhaps the most valuable aspect of the arrangement would be the facilities which would be created for the interchange of patients whereby it would be possible to arrange for those no longer requiring the full legal and nursing facilities of the mental hospital to be readily found accommodation outside. If the buildings and grounds were specially planned and the appropriate staff employed, it would be possible to provide all the facilities for senile psychoses, but this would not necessarily be the policy adopted.

It has been demonstrated that such wards already exist, at least in nucleus, though they are camouflaged by their name and prevented from functioning by lack of the special staffing arrangements. It should be possible for the Regional Hospital Boards to reorganize its facilities along such lines to the great advantage of its patients, and at the same time to make avenues of research into geriatric conditions more obvious.

Nursing Arrangements.

There is probably less glamour and more distasteful duty attached to the nursing of chronic organic dementia cases than in any other branch of nursing. Only the exceptional hospital catering for this type of case has, at present, adequate nursing staff. It is in chronic-sick work that the part-time nurse has been found to be invaluable ; indeed it is only in this sphere that part-time

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nursing may be said to be wholly advantageous both to the patient—who welcomes any environmental change—and to the nurse who is relieved of monotony and the repetition of much unpleasant work. There must be a basis of trained staff (1 to 40 patients is the minimum), while the greater part of the nursing is carried out by the part-trained assistant nurses. The more knowledge of the aetiology of the symptoms shown by their patients, possessed by these assistant nurses, the more interest will they find in their work. It is therefore important that psychological material should be incorporated in the instruction given to pupil assistant nurses. The employment of ward orderlies in these wards is desirable and their duties may be more extensive than in acute hospitals—for example, the feeding of the helpless patients, which is a major item in the routine ward work, may, where the swallowing reflex is normal, be undertaken by sympathetic though unskilled workers.

The high proportion of truly psychiatric cases among the chronic-sick and the difficulty in obtaining nursing staff appears to be an argument for an instruction that, where these cases can be segregated, the nurses attending them should be paid at the mental nurses' scales, which are higher than the General Rushcliffe scale. Such an arrangement would be a little encouragement and reward to the apparently forgotten race of chronic sick nurses.

Summary.

A survey of the psychiatric disorders occurring in cases admitted to hospitals for the chronic-sick demonstrates that 37·3 per cent. of these cases—for administrative purposes regarded as of physical disease—suffer from concomitant or uncomplicated mental illnesses. Details are presented of the psychiatric states found in the survey. These include nearly all the common reaction types. The statistics confirm Lewis's explanation of the difference between British and American methods of estimating and dealing with the numbers of psychoses occurring in the higher age-groups. The clinical features described disclose a field in which specialist advice should be available, but has in the past been rarely utilized. Some suggestions are made for the reorganization of the services under review.

I have to thank Prof. J. Johnstone Jervis, Medical Officer of Health, and Dr. Wm. Mackintosh, Medical Director of Hospitals, City of Leeds, for permission to communicate these observations.

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THE SYNDROME OF VISUAL ALEXIA WITH COLOUR AGNOSIA.

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CASES showing alexia which is not part of a general visual agnosia or of a speech disorder (letter or word blindness, cécité verbale pure) are uncommon and deserve careful study for a variety of reasons. The conception of word blindness as loss of visual memories due to a localized cerebral lesion (Hinshelwood, 1917) has been challenged by later investigators who aimed at a more general analysis of impairment of cerebral functions. The application of the principles of Gestalt psychology has introduced new aspects into the study of word blindness. Investigations into acquired word blindness, apart from their psychological and neuro-pathological interest, are of value for the understanding of congenital word blindness which has been found to be a condition of considerable practical importance. It was the investigation of cases of acquired word blindness which led Hinshelwood to the first full description of the congenital disability.

Word blindness is, as a rule, associated with a disability termed "colour agnosia." The nature of that symptom and its relationship to visual agnosia on the one hand, and to aphasia on the other, have been the subject of controversy over many years. At first it was regarded as an aphasic symptom, later as a form of agnosia. More recently it has again been understood to be caused by the impairment of the same basic function which underlies amnesic aphasia.

The following two cases might contribute to the elucidation of some of the problems outlined above. The first case was under observation for ten months, while in the second case the syndrome was present for two weeks only.

CASE 1.—Mr. J. A—, aged 63, retired engineer, was admitted as a voluntary patient on 23.iii.46. His wife gave the following history :

The patient had been healthy physically and mentally until twenty months prior to his admission. He was of a cheerful disposition and was regarded as a man of good intelligence. He had left school at the age of 14 and had no special training in mathematics. His main interests, apart from his work, were sports and politics. He used to take two daily papers and read them thoroughly. He also read engineering books. He had no difficulty in distinguishing colours before his illness. He used to be an excellent writer. In June, 1944, he complained of a sudden feeling of giddiness. There was no loss of consciousness ; his right arm was weak and numb for a few days. Since that attack he had been unable to read. His memory was bad for some months after the attack, but improved gradually. Apart from an occasional difficulty in remembering names, his speech was unimpaired. During the year preceding his admission he had become very irritable

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and suspicious. He accused his wife of being unfaithful to him and trying to rob him. He complained about insomnia and irritability.

On admission the patient did not show any conspicuous mood or behaviour disorder. When asked why he had come to hospital he referred to the attack in June, 1944, and to his insomnia. Throughout his stay in hospital he never mentioned his suspicions and when questioned either denied or refused to discuss them. His behaviour while under observation was entirely normal.

Physical examination.—The patient was in good general health. His heart was slightly enlarged to the left and the second aortic sound was accentuated. B.P. 170/105. The peripheral arteries were rigid and tortuous, and the fundi showed signs of arteriosclerosis.

Nervous system.—There was a right-sided homonymous hemianopia with intact perimacular fields. The left visual fields were normal for white and colours (green, blue and red were tested). Visual acuity $\frac{6}{6}$ with correction. Those findings were verified by the consultant ophthalmic surgeon, Dr. Fraser. There was no disturbance of gazing. No disturbance of sensation. Stereognosia intact. Serological and cytological examination of the blood were negative. Urine negative.

Throughout the period of observation, which extended over more than ten months, the patient was most co-operative and submitted willingly to testing for any length of time. He regarded the various tests as methods of rehabilitation. It was always easy to attract his attention and he never spontaneously complained of getting tired, although his performance deteriorated when an examination extended over more than half an hour.

The patient was correctly orientated for person, space and time. His general knowledge and knowledge of current events were fair. He sometimes failed when asked the names of leading political personalities, but he could tell their ranks and the parties they belonged to, as well as their most conspicuous personality features. When their names were offered to him among others he picked them out correctly. Recall was moderately impaired. When tested he often failed to remember correctly a date and an address after more than five minutes, but he would remember the nature of the item he was supposed to recall, even after several hours. He always knew the date correctly and he was always able to state when he was admitted and how long he had been in hospital. The use of numbers was unimpaired. He could carry out multiplication, such as 27×12, without difficulty.

When asked to enumerate objects belonging to a certain category, such as capital cities, flowers, tools, furniture, birds, he usually succeeded, with some effort, in naming six to ten examples. His comments showed that in carrying out those tests he imagined a concrete situation, such as a map when enumerating the capital cities, a garden when naming flowers, a workshop when naming tools, etc. He had no difficulty in ordering objects according to certain qualities, such as material, shape, size, etc.

Orientation on his own body and on other persons' bodies was correct. No finger agnosia. Right-left orientation unimpaired.

In the Mill Hill Vocabulary Test he scored Grade 3 (average intelligence) in both definitions and synonyms. He obtained the same grade in Raven's Progressive Matrices. These results showed that neither his vocabulary nor his intelligence could have suffered severely and that his spatial orientation was unimpaired.

Speech.—The patient spoke fluently and with good articulation. In conversation his speech appeared entirely unimpaired and there was no noticeable poverty of nouns. His understanding of spoken language was perfect. Naming of objects, was, as a rule, correct. Only on rare occasions, especially when he was tired, he had difficulty in naming an object, e.g. in a series of tests he successively named handkerchief, wallet, ring and keys, pin, watch, neck-tie, matches, knife, inkwell, cigarette case, torch, radiator, comb, stamps, banknote correctly, but failed to name a desk-lamp (" they use it in offices, an electric.....''). His ability to name colours was greatly impaired (see below).

Writing.—The patient was able to write letters and words dictated to him correctly and without difficulty. Writing of figures of any size and of decimals was unimpaired. Spelling was, as a rule, correct. However, when called to write long words he would sometimes repeat or leave out a letter or a syllable. He made similar mistakes in writing sentences, and he had a tendency to repeat letters,

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syllables and sometimes words for which his inability to read what he had written was obviously responsible. He used to write long letters home daily, describing his experiences in hospital. His letters showed a complete lack of punctuation, except for an occasional dash. He wrote capitals only at the beginning of his letters, which were not divided into paragraphs, and at the beginning of names of persons and animals. Apart from repetitions and occasional omissions the grammar was correct. The following lines taken from one of his letters shows the type of mistakes he made :

> " Dear Flo—
>
> " Just a few lines hoping you are keeping well trusting you are keeping well I am picking up very an improving and before long will be quite well again and Gill how is she getting on wait till I see her she is a good dog though she has a few dirty or should I say rude habits anyway look after her the weather here has been its old self again."

Copying of single letters, short words and numerals was correct. In copying long words he seemed to lose the thread easily and attempted in vain to read what he had written. The same applied to the copying of sentences. Short sentences consisting of words with one or two syllables were, as a rule, copied correctly. It was obvious that he wrote copying letter by letter and he often spelled aloud when copying. Although he would read most letters individually without difficulty he tended to copy " slavishly," e.g. he used to imitate unusual forms of the " s " written by the examiner and when copying a word written in capital letters or letters separated by a certain space he always followed the presented pattern meticulously.

Constructional ability was undisturbed. He could copy and, at request, lay without model patterns of matches, blocks or mosaics. His performance in the Kohs test was normal. He could draw geometrical figures and objects, such as a house, table, bird, hand, hammer with and without pattern. The perspective was correct and the professional touch was unmistakable.

Visual functions.—The patient was not aware of his hemianopia, although he sometimes knocked into objects which were in his right visual field. He was conscious of his alexia. He did not spontaneously refer to his disability of naming colours, but appreciated it when tested. When asked whether, apart from his alexia, there was anything wrong with his vision he used to complain about it being not clear, or blurred, or blotchy, and tended to blame this for his reading difficulties. He stated that for about a week following the sudden onset of his illness print, but not other objects, had appeared upside down. That symptom has passed completely and he did not remember that there had ever been a period when he saw letters sloping. Stationary or moving objects were recognized correctly. He enjoyed attending the cinema and could follow the film without difficulty. He never failed to describe and recognize pictures of objects and scenes correctly. He was able to pick out on request one of a large number of objects or pictures of objects spread before him. He also could recognize and name geometrical patterns. When shown a drawing of a face with a part missing he could fill it in. His visual imagery was unimpaired, but only as far as the shape of objects was concerned. His colour was imagery impaired (see below). There was no disturbance of spatial orientation. He found his way about the ward and in the hospital grounds without difficulty. He judged distances well and localized the position of objects in space correctly. The appreciation of perspective was unimpaired. The estimation of absolute and relative length and size was normal. He could connect two dots with a straight line and halve that line accurately, provided its right extremity did not fall into his right visual field. His topographical memory was good and he could draw a sketch of the ward with the correct position of his bed. He could read the time from a watch and he could set the hands of a watch to a given time.

Reading.—Single letters were, with some exceptions, recognized correctly. He often failed in recognizing letters of an angular shape, such as " K " (which he often read as " X "), or " N " or " X " (read as " K " or " I "), or " F " (often mistaken for " I "). Less frequently he mistook letters of circular shape for similar ones, such as " D " for " O," " P " for " Q," " Q " for " G," etc. Often the mistakes were of the mirror type, e.g. " b " was read as " d" and vice versa.

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Drawing of cross hatching marks across the letters did not noticeably interfere with his performance. There was no indication that in reading he availed himself of other than visual aids, such as " writing movements " with his hands or head. If letters were put before him in wrong position in space he could read them as well as those presented in the correct position. The shorter the time of exposition, the more frequent were the mistakes, but he did not show any type of mistake on short exposition which did not appear otherwise.

Tachystoscopic examinations were carried out together with Dr. Pickford at the Psychological Department of Glasgow University. Single letters were exposed for one-fifth and one-tenth of a second. When coloured letters were exposed the performance did not suffer noticeably. However, when the patient was requested to read the letter and also to note the colour he made many more mistakes, and several times he failed to identify either when the time of exposure was below half a second.

When requested to pick out certain letters from a set of block letters or from a printed word he succeeded as a rule very well. Foreign letters, e.g. Greek, were recognized as such. In trying to identify wooden block letters stereognostically he made similar mistakes, as in reading visually.

When letters were written on his skin with his eyes closed he usually recognized the circular and bent shaped, such as B, R, S, D, O; sometimes he mistook them for similar ones, e.g. G for O, C for J, J for P. He could identify the simple angular letters L, T, V, drawn on his skin, but he failed with the more complicated ones, such as F, M, H.

Punctuation marks were not recognized at all, irrespective of whether they were presented within the context of sentences or isolated. He described them correctly as dots or geometrical figures, but they had no symbolic meaning for him.

Reading of words.—The patient could read words only with the help of spelling. Having spelled the word aloud or to himself he would say it correctly. Only very short and common words consisting of not more than three letters he would occasionally read without spelling. In spelling longer or unusual words he lost the thread easily and he often gave up after the second or third letter. When trying to read a long word he would drop letters or read them incorrectly, even if they did not belong to the types of letters which he found it difficult to identify singly. When his attention was drawn to a mistake he sometimes rectified it.

Extracts from examination records:

" Evening " (handwritten): " e, v, e, n, i, n, g—evening."

" Robert " (handwritten): " r, o, m, e, r, t." When the " m " was questioned he said, " It's a ' b ' I think."

" Horse ": " h, o, r, s, e—horse."

" Tempest " (print): " t, e, m, n, e, s."

Tomato, sand, table, air, soil were spelled and read correctly.

" Chestnut " (print): " You see n, u, t at the end. The first letter seems to bother me. I should know it; I have seen it. Is it not a ' w ' ? I might be a ' c '." He now spelt and read the word correctly.

He often declared spontaneously that he had mis-read a letter, but was not always able to choose the correct letter when it was said among others, e.g. " Hips " (print): " That's not ' n ' ? (Points to the first letter.) " n, i, p, but I think I got the first letter wrong." He did not pick the " H " when it was offered among other letters.

Sometimes he would grasp the approximate meaning of the word, or name the category to which it belonged, but he was unable to read it; for instance, " elderberries ": " Something belonging to fruit, but I cannot put it together."

In attempting to read short sentences he failed in the same way as he did in reading words, but he made spelling mistakes in reading short words which he would spell correctly when they were presented alone. For instance, when the sentence " It is rather cool to-night " was presented he read " It is r, a, t, p, e, r, c, o, a, t t, o, b, i."

When incorrectly spelt words which were not too long were presented he was, as a rule, able to rectify the mistake, e.g. in " Hause " he replaced the " a " by " o "; in windowe he struck out the " e."

When a letter or two were left out in the word he often succeeded in filling in

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the missing letters when told their number, e.g. " s–n" he completed to " sin " ; " h—se " to " house " ; " Mo–day " to " Monday," etc.

Reading of Arabic figures including decimals was unimpaired. He could read numbers such as 45,360,471 correctly without hesitation. He was quite unable to read Roman figures beyond IV. It was obvious from his mistakes that he set about reading them in the same way as Arabic figures, e.g. XXVII " Ten thousand, ten hundred and fifty-three."

Musical notes had always been unknown to him.

Colour Vision and Recognition of Colours.

The patient very frequently failed in naming colours correctly, irrespective of the setting in which they were presented. This disability became more obvious when he was tired and when he had to describe multi-coloured objects or pictures. He was not colour-blind. He could distinguish yellow and blue, and green and red, but he frequently failed to name them correctly. In the Ishihara Test his responses were those of a subject with normal colour vision although he often failed in naming the colours of the dots constituting the numerals and the background ; e.g. in Plate 1 he read the number " 12 " consisting of bright red dots on a background of blue dots correctly, but he described the red dots as yellow and the blue ones as green. In Plate 2 he named the dark and bright green of the background correctly, but he described the various shades of red and yellow constituting the figure 8 as " pinkish." Sometimes the colour of the background seemed to influence the naming of the dots constituting the numerals. The absence of colour-blindness was confirmed by Dr. Pickford, who repeated the Ishihara Test and also carried out colorimetric examinations and the Holmgren Wool Test.

In naming colours he failed with some more often than with others, but there was none which he would invariably name correctly. He could always distinguish shades of brightness and never failed in recognizing the identity of colours in different objects. His performance varied a great deal. In the same series of tests he would give the right name of a colour, and five minutes later make gross mistakes when it was presented again. Even when he chose the correct name he very often was uncertain and frequently qualified his description by the suffix " ish." White was described as " cream " or as " whitish," black as a rule as " blackish " and sometimes as " dark blue." Sometimes, when he mis-named a colour, certain features of the colour presented such as brightness, appeared in the wrong name. For instance, a bright green was called " pinkish." When told that he had mis-named a colour he would, as a rule, admit this, but only rarely was he able to rectify his mistake, occasionally he insisted on his description and admitted his error only when the colour, the name of which he had chosen by mistake, was immediately presented to him.

The patient frequently characterized a colour by relating it to an object, the colour of which was familiar to him. Brown or red objects were often called " stone coloured," grey objects " slate-coloured," etc. On other occasions the correct name was enforced by reference to concrete objects.

Extracts from examination records :

Brown wallet : " Brownish as far as I can see."

Blue stamp : " Blue."

Black button : " Not quite black, but it is near it."

Maroon-coloured wallet : " Reddish. It might be green." A week later he said, when shown the same article, " It is green, it might be blue." (Is this the colour of grass ?). " There's a difference in shade, but if you take the average I would say yes." (This is red.) " No." Now a green square was shown to him and he named the colour correctly. When the wallet was presented again immediately afterwards he said " You are right. It flashed on me as green."

Red tie : " I can't remember. It doesn't seem to be red."

Blue ink : " Blue or green."

Buff coloured case book cover with dark red back and green string : He describes the buff as " yellow," the dark red as " reddish " and was unable to find a name for the green.

When asked to name the colours of the carpet in the office he described orange as " stone-colour " and blue as " green." He was able to match the green of the examiner's socks with an identical colour on the carpet.

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Coloured pictures :—

Baby in green tub : Correct.
Blue shoe : " Green."
Grey pail : " A slatish colour."
Orange-red pail : " Salmon colour."
Red pail with blue and white stripes : The red is named correctly, the blue as " green," the white as " cream " and the black background as " blackish."
Green book-cover : " Greenish."
Orange book-cover : " That would baffle me."
Yellow book-cover : " This is a colour I am beat on."

On a picture post-card he described the pink correctly, the green as " blue," the yellow as " straw colour," the blue of the sea as " green." The blue of the sky was very frequently described as " green," but he usually rectified this when a real green was presented immediately afterwards. On other occasions he would describe green and blue correctly. The description of mixed and intermediate colours he found most difficult. Purple was described as " reddish, or on the brown side."

Coloured skeins :—

White : " Cream " or " whitish " or " whitish cream."
Light brown : " A biscuit colour."
Yellow : Correct.
Light green he calls " light blue."
Light blue : " A light blue." He now spontaneously calls the light green " a yellowish colour."
Dark green : " Black with bluish colour."
Red and black were, on that occasion, described correctly.

The patient made similar mistakes in naming coloured squares, or the surfaces of the Kohs Blocks. The size of the coloured surfaces made no marked difference to the quality of his performances.

When requested to point out certain colours in a multi-coloured object or picture he did this, as a rule, correctly, but often failed in differentiating green and blue. He made the same mistake in Holmgren's wool sorting test. He was aware of this difficulty. In the sorting test he was rather uncertain in separating red and brown. Even if he did not sort colours incorrectly he tended, in that test, to leave out those which were not very similar to the one which he had chosen first, or which had been handed to him. He chose according to likeness rather than to category of colour. He was able, however, to sort colours according to their brightness.

When requested to pick out coloured skeins to match the colours of an object named by the examiner, he succeeded as a rule, but not without considerable hesitation. In this test, too, differentiation between green and blue was the most difficult. Which colour is a pillar box ? " It would be a blue with a red—Post Office red." (Pt. picks a brown-red skein first, then a bright red.) Grass ? : Pt. picks light green. Sky ? : Picks dark green. Blood? : Correct. Tomato ? : He hesitates, points to purple, then to orange, adding that the latter was more likely to be correct.

The patient was requested to enumerate objects of certain colours named by the examiner. His performance was poor. He mentioned trees and grass as green objects ; Post Office red, danger lights, certain tram-cars, as the only representatives of red objects. He found it equally difficult to name objects to match colours shown to him.

Reactions to wrong colours.—The patient was shown drawings from a children's painting book in which some sketches were painted by the examiner in wrong colours. He invariably rejected a wrong colour and characterized it as unreal, although he was, as a rule, unable to name it correctly. Red frog : " This is not the right colour." What is the right colour ? : " It might be darkish brown." Green dog : " You never see them with that colour. It's blue, it's a toy colour." Black basket with purple fruit : " The basket might be right, but the colour of the fruit is too dark." He was shown drawings of three horses painted red, brown and green respectively. He pointed to the brown as the only correct one ; about the others he said " Kiddies might do it like that."

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Colour imagery.—In describing colours of objects from memory the patient often failed. Not infrequently he appeared to describe a colour of the real object as it is seen in every day life rather than as it ought to be, e.g. when describing a goose as " greyish to whitish." On other occasions he failed absurdly. In his imagery, too, he showed a tendency to qualify his descriptions of colours. His imagery of forms of objects was intact.

Extract from examination record: Colour of blood—correct; Grass—correct; —aven—" I bit of grey in green "; Swan—" different colours. Some are green, others whitish "; Raspberry—" reddish "; Frog—" blue-grey or brown "; Goose—" greyish to whitish, according to age "; Sunflower—" yellow, and white in the centre." Cigar—correct; Roses—" red, blue, green or pink."

On the following day he described blood as " stone-coloured."

Progress notes.—The patient was discharged on 4.ix.46, but had to be re-admitted two months later owing to his paranoid behaviour at home. His condition did not change materially during the period of observation which had extended over ten months at the time of the conclusion of this article. However, certain changes in the relative degree of his symptoms took place. While the word blindness remained entirely unaltered, the colour agnosia showed a definite improvement. During the second half of the observation period mistakes in naming colours became less frequent and the patient did not use the qualifying suffix " ish " as often as previously. The most constant of his errors was still the confusion between green and blue. In recent months his colour imagery was noticeably improved, but he would still make characteristic mistakes occasionally, e.g. on 10.ii.46 he described from his memory the colour of a lion as " greyish " and that of a crow as " varying from black to grey," while the colours of ten other objects were named correctly in the same series of tests.

CASE 2.—Mr. A. J—, aged 68, retired bank clerk, was admitted as a voluntary patient on 3.ii.47. According to his relatives he had been in good health until December, 1946, when he became depressed and agitated, blamed himself for having led a wicked life and expressed fear of punishment. Sleep and appetite were poor. On admission his physical condition was found to be very satisfactory for his age. He did not show signs of arteriosclerosis. Blood-pressure 120/65. There were no signs or symptoms of an organic nervous disorder. The reflexes were normal. Patient was severely depressed and agitated; he expressed ideas of unworthiness, blamed himself for having masturbated in his younger years, and for not having offered to marry a girl whom he met thirty-five years ago. He complained about insomnia and frontal headaches. There were no signs of intellectual impairment. Orientation was intact. General knowledge and knowledge of current events were very good. He carried out arithmetical tests promptly and accurately and could recall a date and an address after half an hour. The diagnosis was agitated depression in senio. In view of the severe depression, electric convulsion treatment was instituted.

The patient had four treatments between 8 and 15 February, following which the depression subsided completely.

On 12 March the patient complained that he was unable to read, although he could recognize single letters. He said that his vision was blurred. The patient presented the syndrome right-sided homonomous hemianopia, word blindness and colour agnosia. He had no difficulty in naming objects, nor did he show any other features of dysphasia. Spontaneous writing of words and figures as well as writing on dictation were unimpaired. The patient used capital letters and punctuation marks correctly. When copying, he showed, like Case 1, a marked tendency to imitating peculiarities of the presented patterns. Constructional ability was unimpaired and he could draw simple geometrical figures correctly. Orientation in space and on his own body was unimpaired.

The patient was unaware of his hemianopia. He complained about his vision in the same way as Case 1. Acuity of vision was $\frac{6}{9}$ (corr.).

Reading.—Single letters of any type were, as a rule, recognized correctly. In reading the patient did not avail himself of non-visual aids. Occasionally he failed in recognizing a letter of angular and rather complex pattern, such as " W " or " E." Tachystoscopic examinations were not carried out. In trying to recognize

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letters written on his skin, similar mistakes occurred as in visual reading. Arabic figures of any size, with and without decimals, were read correctly. The patient was able to carry out sizable multiplications (such as 244 × 7) and other oral arithmetical tests of a similar range accurately. On paper he could operate correctly with much higher figures. In trying to read Roman figures he failed in exactly the same way as Case 1, being unable to recognize figures beyond IV. In attempting to read words he behaved in the same way as did Case 1. He could recognize spelling mistakes and fill in missing letters if the word consisted of not more than three syllables.

Colour vision and recognition of colours.—The patient did not show signs of defective colour vision. In the Ishihara test his responses were normal, although he very often failed in naming the colours of the dots correctly. He made mistakes in naming and sorting colours. He was less inconsistent in his mistakes than Case 1. Certain misnomers occurred more frequently than others. Green was hardly ever named correctly. The lighter shades of green were frequently called " yellow " or " yellowish " and sometimes " bluish." The darker shades were as a rule called " blue." Red was sometimes called " brown." A dark brown was often called " black " and sometimes " purple." Similar mistakes were made in describing colours of objects presented to him. Like Case 1, he often qualified the colour named by appending the suffix " ish." When requested to sort skeins of coloured wool he failed in differentiating blue from green, and light green from yellow.

When tested for colour imagery he made mistakes almost identical with those of Case 1. In a series of tests he named the colours of a raspberry, a cigar, grass, crow, correctly. A goose was described as " greyish," a lion as " doubtful greyish," an elephant as " blackish to brownish," a frog as " brownish," a daffodil as " yellowish."

When requested to enumerate objects of a certain colour from memory his performance was poor ; for instance, when asked to enumerate red objects he named " red ink, red pencils, red dresses, red frocks, red paint." When pressed to mention objects which were red by nature he only named poppies. He found it generally difficult to list objects belonging to a certain category and, like Case 1, had to imagine real situations when trying to do so.

Progress notes.—The patient presented the syndrome described above for only two weeks. On 26 March he complained about being confused. Clinical examination revealed a severe nominal aphasia with marked paraphasias. Understanding of spoken language was slightly impaired. In writing he showed the same type of paraphasia as in speaking. He was unable to read and to name colours. As a rule he did not even attempt to do so. He was very distressed about his disabilities and gave up immediately he found a task difficult to perform. His condition deteriorated rapidly. On 25 March he was unable to express himself and the only residue of his speech was the recurrent utterance, " I shall be all right," with which he responded to questions put to him. A right-sided hemiparesis developed, more marked on the arm than on the leg. On 27 March the right extremities were completely paralysed and the patient gradually lapsed into unconsciousness. He died on 29.iii.47. Permission for post-mortem examination was not granted.

Comment.

The patients presented the syndrome of alexia with colour agnosia, which was associated with a right-sided hemianopia. Only a small number of cases have been reported in which this syndrome was not complicated by marked aphasia and disorientation in space. Although typical in many respects, the two cases showed some uncommon features which deserve comment. The alexia could be described as word-blindness with partial letter-blindness. In the majority of cases of word-blindness the recognition of letters is not entirely unimpaired, but little is known about the type of mistakes which word-blind patients tend to make in reading letters. The partial letter-blindness in the two cases pre-

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sented above was typical of the visual alexia (Pötzl, 1928) in cases with occipital lesions. In those cases the errors in the recognition of letters are visually conditioned, i.e. they can be explained by incomplete visual comprehension of the shapes of the letters. This type of mistake distinguishes the visual (occipital) alexia from the parietal or temporal in which the paraphasic element can be traced.

It is worthy of interest that the type of letters which Case 1 frequently, and Case 2 sometimes, failed to recognize was the same which patients with impairment of epicritic cutaneous sensibility find it difficult to identify when they are written on the skin. The present writer (1927), in a study on the tactile perception of movement on the body surface, has found that patients with disturbance of superficial sensation fail in comprehending angular geometrical figures written on their skin much earlier than in the recognition of circular ones. The similarity between this type of impairment of tactile perception and the errors of partial letter-blindness is of interest as it suggests a more intimate relationship between perception and recognition than is often assumed.

Word-blindness lends itself even more than other disabilities of higher cerebral functions to interpretation in terms of Gestalt psychology. There can be no doubt that the word-blind patient has lost the ability to conceive the word as a unit and that he tries to overcome that disability by proceeding piecemeal, reading letter by letter. His mistakes in reading letters can also be interpreted as the expression of an inability to comprehend certain configurations as wholes. It is not a coincidence that the patients found it most difficult to identify letters of angular shapes which are more complex than the circular ones, and, as configurations, lack completeness. However, it is well to remember that the ability to comprehend organized wholes is not a function which can be isolated from the process of perception. This has again been stressed recently by Goldstein (1943), who introduced Gestalt principles into the analysis of cerebral symptoms.

These patients, like other cases of " pure word-blindness," read words by spelling them. By attempting to read sentences or long words by that method they failed badly and appeared almost completely letter-blind. This is an example of a breakdown of a mechanism of compensation by the help of which the patient attempts to circumvent his disability. The difficulty of the task produced what Goldstein called a catastrophic situation.

Writing is, as a rule, unimpaired in cases of word-blindness. The writing in Case 1 showed certain abnormal features. They were, however, not typical of any known form of agraphia, but could be attributed to the alexia. The occasional omissions and repetitions of letters and syllables can be explained by the patient's inability to read his own writing. The failure to use capital letters at the beginning of sentences and the absence of punctuation were probably due to the same cause. The patient wrote as he spoke. The use of capital letters at the beginning of sentences and the application of punctuation marks are late acquisitions in the learning of written language. In word-blindness the visual comprehension of sentences as organized wholes is lost and this is obviously the cause of this patient's inability to use the demarcating symbols. However, it remains to explain why a word-blind person, even if

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he be unable to recognize punctuation marks, should not apply them in writing in the same way as he writes words that he cannot read. Possibly the length of the period over which the alexia has been in existence, i.e. the time of the disuse of punctuation marks, is the decisive factor. The patient, while trying to overcome his word-blindness by spelling single words, had long given up any attempt to read sentences, and punctuation marks have ceased to be of any use to him from the moment he has become alectic. Disuse of that group of symbols, which are the latest acquisitions in the process of learning to write, and the use of which remains precarious even in many normal subjects, may be responsible for the inability of some word-blind patients to recognize and to use punctuation marks. In Case 2, where the alexia existed only over a short period, the use of, and the ability to read punctuation marks were intact. It must also be taken into consideration that punctuation marks form a group of symbols in the acquisition of which acoustic aid, which plays such a great part in learning to read and to write, is almost negligible. This is probably one of the reasons why the acquisition of their correct use is difficult and why this ability is particularly vulnerable in cases of reading and writing disorders. The present author is not aware of any special observations on the use of punctuation in congenital word-blindness reported in the literature. It should be expected that in those cases the acquisition of the correct use of punctuation would be found to be more difficult than normally.

An interesting feature in both cases was the intactness of the ability to read Arabic numerals of any size, while the ability to read Roman figures beyond IV had been lost. One of Pötzl's (1928) cases showed exactly the same symptom. The patients described here attempted to read Roman figures in the same way as Arabic numerals. The only explanation for this discrepancy is again late acquisition and disuse.

The patients' ability to name colours was impaired, although they were not colour-blind in the usual meaning of the term. Wilbrandt (1887) described that symptom as amnesic colour-blindness and regarded it as an aphasic disorder. Lewandowsky (1908) attributed it to a dissociation of the conception of colours from that of objects. Sittig (1921) was the first to note that those patients often failed in sorting colours, which proved that the symptoms could not be of the nature of an amnesic aphasia for colour names. In his view that disability was the result of a combination of visual and aphasic disorders, the difficulty in sorting colours being due to the visual-agnostic component. Gelb and Goldstein (1918), rejecting all previous theories, expressed the opinion that the disability was the result of an impairment of "categorical behaviour." Patients in whom this basic function is affected behave and think in a primitive manner, i.e. according to the concrete situations in which they find themselves. They tend to name and sort objects according to their likeness, and to the way in which they fit into concrete situations, rather than as representatives of certain categories. The authors found the same impairment of categorical thinking in a variety of symptoms due to cortical lesions, particularly in amnesic (nominal) aphasia. This is not the place to enter into a discussion of this theory, the general applicability of which has been widely debated (Mayer-Gross and Guttmann, 1936, a.o.). The cases presented above showed

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a variety of features similar to those on which Gelb and Goldstein's conceptions were based. In sorting colours the patients tended to choose more according to likeness than to categories. When enumerating objects belonging to the category they imagined concrete situations. In naming individual colours Case 1 often referred to concrete objects of the same colour. However, it is open to doubt whether the impairment of categorical behaviour which can be demonstrated in certain cases of colour agnosia is really the basic disorder underlying that disability, or if it is not, as Pötzl (1928) suggested, secondary to a disturbance of visual functions which still requires elucidation. The cases reported here showed certain features which it would be difficult to fit into the above theory. Although they were not colour-blind in the narrow sense, their references to their visual impressions in general, and the qualifying terms (" bluish, yellowish," etc.) which they used in describing colours in particular, suggested that colour perception was not quite intact. It is, however, still impossible to define in what way it deviated from normal. It is of interest that there are certain features which colour agnosia shares with defective colour vision. The differentiation between green and blue which is invariably impaired in colour agnosia is known to be difficult in anomalous trichomatic subjects whose colour vision is constitutionally inferior. Some errors which the patients presented above and others reported in the literature made in naming colours were reminiscent of the errors of colour defective persons, who, as Wright (1946) has pointed out, describe at various times the same stimulus by several different names, or call different stimuli by the same name. White and black are, as a rule, recognized in colour agnosia, as well as in defective colour vision. Their description as " whitish " or " creamish " and " blackish " suggests some abnormality of perception. Pötzl (1928) has assumed that lesions of the cortical fields adjoining the area striata tend to modify the functions of the latter and the observations reported above lend weight to that theory. One of the results of that modifying influence seems to be an interference with the established correlations which exist between colours and their names.

The two cases demonstrate that the difficulty in naming colours is not part of an aphasic disorder. Case 1 showed only a very slight disability in naming objects at a time when the naming of colours was gravely impaired, Case 2 none at all. The cases described by Brain (1941) and A. Adler (1944) in which colour agnosia was observed without any signs of aphasia demonstrate equally clearly that the symptom is independent of a disorder of speech. Such observations argue against Nielsen's (1947) contention that colour agnosia is an aphasic disorder, the impairment being one of symbolization. Pötzl (1928), in describing the symptom as aphasic, made it clear that he regarded it as a basically agnostic disorder resulting in a difficulty of naming.

It is noteworthy that in Case 1 the colour agnosia improved while the word-blindness remained unaltered. The improvement of the former might have been due to the development of mechanisms of compensation in the brain. Frequent testing probably stimulated such a process. The fact that the word-blindness did not show the same improvement suggests a functional independence of the two symptoms of each other. The regular combination of

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visual alexia with colour agnosia cannot be explained on psychological or physiological grounds. It is obviously due to an intimate anatomical relationship of the cerebral structures, the lesions of which are responsible for the symptoms. Congenital word-blindness, which has a different pathology, is not associated with a disability of naming colours.

The clinical observations presented cannot contribute directly to the pathology of the syndrome which was obviously the result of a localized vascular lesion in both cases. Since Déjerine (1892), pure word-blindness has been associated with lesions of the left gyrus angularis, of its connections with the visual area and of the splenium corporis callosi. More recently cases have been reported in which the lesions were localized in the lingual and fusiform gyri of the left hemisphere and the validity of Déjerine's localization has been questioned, especially for cases in which word-blindness was not associated with agraphia and disorientation in space (Bouman, 1928 ; Pötzl, 1928 ; Brouwer, 1932 ; Kleist, 1934 ; Weisenburg and McBride, 1935). It is worthy of note that in the case reported by Hinshelwood, MacPhail and Ferguson (1904) there was extensive destruction of the left fusiform and lingual gyri, while the angular gyrus was not directly affected. For this reason Pötzl classified the word-blindness of the type described in this article as occipital alexia. At the time when the pathology of pure word-blindness was first studied much less was known about the sympatomatology of angular lesions than is known to-day. It is therefore of interest to note that pure word-blindness has never been found associated with Gerstmann's syndrome which results from lesions of the left angular gyrus. This argues, from the clinical point of view, against the assumption that damage to that area or its immediate neighbourhood is responsible for pure word-blindness.

Summary.

Two cases have been reported which presented the syndrome of visual alexia with colour agnosia in unusual purity. The alexia was of the nature of a word-blindness with partial letter-blindness. The types of errors which the patients made in reading letters have been analysed. Certain abnormal features in the writing of Case 1 have been shown to be related to his alexia. The patient did not write capital letters at the beginning of sentences and he was unable to read punctuation marks and to apply them in writing. The significance of those disabilities has been considered.

The various theories on colour agnosia have been discussed. Certain features which colour agnosia has in common with defective colour vision have been pointed out. During the period of observation the colour agnosia in Case 1 improved considerably while the alexia remained unaltered.

The cerebral localization of the lesion causing the syndrome has been discussed.

I wish to express my thanks to Dr. W. R. Pickford of the Psychological Department of Glasgow University for carrying out the tachystoscopic examinations and the tests for colour vision in Case 1.

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THE SYNDROME OF ALEXIA AND AMNESIC APHASIA. SUBARACHNOIDAL HAEMORRHAGE WITH SYMPTOM OF PARTIAL OCCLUSION OF THE SPINAL SUBARACHNOIDAL SPACE.

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INTRODUCTION.

AMNESIC aphasia has a peculiar position within the aphasic disorders, and it has always been found difficult to bring it into any aphasic scheme. The nearest to it in Head's (1926) classification of symbolic disorder is his nominal aphasia. This, however, is actually a sensory aphasia, in which the difficulty in finding words prevails; it has lost all the characteristics of the classical amnesic speech disorder. Goldstein (1926), on the other hand, while stressing the existence of the amnesic aphasia as a definite and well-circumscribed type of disorder, denies that it has anything to do with a speech defect—an opinion up to then held. According to him, it is fundamentally a defect in the thinking process in which the patients have sunk to a lower and more concrete level of behaviour. They have, according to Goldstein (1926), lost the categorical meaning and use of words; they may be able to name an object in a concrete situation, but are unable to generalize, to use the word in its class meaning. Since then this question has been critically examined by several authors (Hauptmann (1931), Isserlin (1936), von Kuenburg (1930), Lotmar (1933), Scheller (1938)) in the light of Goldstein's conception. In their conclusions, repudiating Goldstein's opinion, they reaffirmed the classical view of a basic speech disorder in the amnesic aphasia.

Word-blindness occurs mainly in two forms in localized brain lesions: firstly, in connection with aphasic symptoms, when it is regarded as an expression of defect in internal language; secondly, on a visual-agnostic base, sometimes accompanied by lesser symptoms of an agnostic type. In the Wernicke-Déjerine (1892) conception, the term "pure word-blindness" has been used for cases showing no defect of internal language or writing. In recent publications there has been a tendency to disregard these guiding principles, and to speak of "pure word-blindness" in cases where the defect in reading is the most outstanding symptom. There is hardly any case in the literature where the alexia was completely pure. Among the purest cases known one finds slight difficulty in writing, visual disorders—especially colour-agnosia—and as the most frequent concurrent disturbance, amnesic aphasia. Neurologically a contralateral homonymous hemianopia is a frequent and usually isolated

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sign. This syndrome of word-blindness, amnesic aphasia, and homonymous hemianopia (here of the superior quadrant) is the outstanding feature of the case described.

Case history.—J. P—, a woman, aged 47, who had complained of feeling ill for about a fortnight, suddenly became semi-comatose; she was admitted on the same day to the Bristol Royal Infirmary in a drowsy condition.

12.x.46: On her examination in this hospital, neck rigidity and Kernig's sign were found and haemorrhages in both retinae. There was albumen and sugar in the urine. Blood pressure was 160/100; pulse rate about 80. Knee jerks were absent. Lumbar puncture showed blood-stained fluid and the pressure was 300. After lumbar puncture the patient appeared to be more alert and responsive. Two days later, after another lumbar puncture, she became confused and talkative. At the third lumbar puncture, two days later, it was noted that although the pressure climbed slowly to 300, the fluid dripped out at about one drop per second. Next day the patient became more confused, started singing and throwing herself about, and had to be kept under sedatives. This state persisted until a week later, when she was transferred to the Bristol Mental Hospital (25.x.46). During this time there was no change in her somatic signs.

25.x.46: On admission she was quiet, responsive, and co-operative, but she showed a profound confusion, with complete disorientation in time, space, surroundings, and her own self. She was uncertain about her age and her name, and denied that she had a husband and child. She could not give any definite account of the remote or recent past, and was unable to reproduce any of her acquired knowledge. Frequently, when questioned she said she was unable to think, and her final answer was that she did not know.

Though her spontaneous speech was generally fluent, without paraphasias, she often had difficulty in finding the right word; this disturbance became obvious when she had to name objects. Often unable to find the right name for common articles, she always tried spontaneously and successfully to define them.

Neurologically there was a small haemorrhage in the otherwise normal right fundus; the fundus of the left eye could not be seen clearly, owing to a recent haemorrhage into the vitreous body. Stiffness of neck and Kernig were still present. Cranial nerves (a perimetric visual field was not done at this time) appeared intact, and there was nothing abnormal in the upper limbs. There was, however, a paresis of the lower limbs, more marked on the right side than on the left. Both knee jerks and ankle reflexes were low but present, and on both sides there was a dorsal response of the big toe. Muscular tone was somewhat decreased; superficial and deep sensory qualities were everywhere intact.

A few days later a more comprehensive examination was possible. Her confusion was now less severe, though she was still gravely disorientated; she was able to give patchy general information about herself, but her answers were still slow. She would answer all questions in a rather stereotyped way—"Let me think; I have to think." The nominal aphasic and alectic disorders, which were studied in detail in a succession of examinations and which attracted our main interest, will be described later. Her speech, apart from occasional difficulty in finding the right expression, was fluent, with no paraphasias or grammatical errors. Abstract words, even the more uncommon ones, were well defined, and she was always sure of their meaning. Her understanding was excellent. Her right-left orientation was faultless. She pointed to her fingers and various parts of the body named promptly, except for the shin-bone and thigh, over which she regularly made mistakes, which might indicate isolated slight defects in her understanding or in body orientation.

Her visual-agnostic functions were practically intact. She recognized articles and simple pictures immediately, and was able to give a detailed description of complex situational pictures. She picked out any article from a large number exposed (in spite of her visual field defect), and did simple jigsaw puzzles reasonably quickly. She recognized colours, and had little difficulty in naming them; in sorting them out she was at first hindered by their varying degrees of brightness, but when she understood that only colour and not brightness mattered, she sorted them successfully. She was immediately aware of a missing part in a drawing

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and completed it promptly; only in one instance where part of a bicycle was drawn in a schematic way was she unable to say what it represented. Her visual memory was fairly good, and she had no difficulty in visualizing persons, objects, or living things. Her orientation in place was good: she described familiar routes and places well. Her orientation on the map of England was about what one would expect of her educational level and interests. She was able to estimate absolute and relative distances fairly accurately.

Her drawing was very good and showed skill above the average. Her free-style writing was fluent, and the character of her writing was the same as before her illness. She occasionally made spelling mistakes, especially in long words, and she also made some mistakes in dictation. When she had to copy she could not be induced to keep strictly to the text; first she tried to read or spell it, and then she wrote it down according to her own reading. She copied geometrical figures well, and picked out promptly all the single figures in a complex drawing composed of different figures.

She was unable to do even the simplest calculations; the best she could do was to write single and compound figures correctly, the latter up to a thousand. From there on she became uncertain about the position value. She apparently understood figures up to twenty; these figures she was able to mark with her fingers. Occasionally she succeeded in adding two simple figures together. That was roughly the limit of her capacities. She had no conception of subtraction, multiplication, or division, and no idea about the method—whether she had to do it orally or in writing. She could not write down decimals at all, and fractions uncertainly, and only after she had worked her way up from the familiar half. Plus, minus, division and multiplication signs had no mathematical meaning for her; characteristically, when a multiplication sign was shown her by itself, she interpreted it as a kiss in a letter. In contrast to this she explained a question-mark correctly.

Language in relation to naming: as mentioned before, her conversational language was, apart from occasional hesitation when she had difficulty in finding the proper expression, fluent and correct. She never failed to follow conversation, was able to carry out all the orders given to her, and understood and could define difficult abstract expressions. She was able to give an appropriate interpretation of proverbs. She showed, however, a very marked disturbance in naming objects. The difficulty in producing names appeared under various circumstances. When asked, for instance, to name all the flowers or animals or something similar, her answers were extremely poor; she had to think a long time, and in the end gave only two or three names. She was equally unsuccessful when asked to form a word from a given initial letter. Her failure was not confined to nouns. She failed consistently in giving synonyms for words such as " nice " and " big," and opposites for words like " ugly," for which her answer was " not ugly." These are representative examples of a number of similar reactions. She was, on the other hand, able to generalize, to find the common property contained in a variety of objects named; she did much better in finding the generic name than in the previous problems, when she had to produce a larger number of words; but even when she failed to form the exact expression she could always make it clear that she had the right conception. She had no difficulty in forming a sentence out of two or three given words. Her spelling was good, with only occasional mistakes.

Reading: she was consistently unable to read the letter X, and with a few other letters, such as P and R, she was often doubtful; she was less certain with capital than with ordinary letters. It did not make any difference whether they were printed or written. She made the same mistakes feeling wooden letters when blindfolded. She could read simple figures correctly and complex figures without error in position up to a thousand. She was much less certain about letters when she had to spell a word than when she had to read single letters. When letters were distributed on a paper at some distance from each other, she had great difficulty in finding the letter required; she was, on the other hand, very prompt in finding a figure named among figures written in the same way. It took her a long time to find a letter out of a pack of cards on which the letters were printed; she did it inaccurately. When capital letters were written on her palm whilst she had her eyes closed, she made mistakes as in reading, failing with the same letters, although again the identification of figures was prompt and correct. The reading of words

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and even more so of sentences was gravely disturbed. She succeeded relatively frequently in reading a short word, but almost invariably found difficulty with longer words; in these the ending confused her most, and she often remarked, "It looks strange." She consistently tried to spell the word first, and by these means proved more successful. She never failed to understand and interpret the word she read correctly. To our surprise she was also able to give the meaning of a word she could not read. She would read the word paraphasically or say she could not read it at all, but when asked what it meant would give the correct interpretation; and after a while she would even name the word correctly. When a number of different words were written on a paper and she had to point to the words named she was successful in about two out of five cases, but it always took her a long time to pick these out. The result was the same when the words chosen were of similar spelling. She rarely succeeded in putting the right letter in an incomplete word, and did so only when she had completed and comprehended the word by her attempt to read it. Similar results were obtained when she was asked to pick out the correctly spelled word from three different versions. The longer the sentences and the more lines she had to read, the poorer were the results; her difficulties were essentially the same as with single words. She was sometimes able to complete a sentence in which a word was left out, but only when she was able to read and understand the part of the sentence presented to her. Usually she did not find any sense and was consequently unable to suggest an answer. The most striking findings were the instances where she gave an approximate interpretation of writing which she could not read. Examples will illustrate this: she was asked to read the following print: "D is for donkey standing still, a ride on whom is such a thrill." She read: "D is for donet I stand ilt," saying "that what it looks"; "mechan and is like a chander." When asked what it meant, she said immediately: "A little donkey, he got to stand still—and then they meet him and tell the ass to stop pretty quiet." When asked again to read it, she said: "I cannot tell what they are, but they come back into my mind afterwards"; and on the next attempt, "It looks to me like isander and something about food." When asked to read the word "still," she said, "I should call it nearth." When asked to spell it she first spelt it "stell," then correctly, also understanding its meaning. Asked to read "a ride on him," she read the first two words correctly, but still could not read the next; she said "duch," then "it spells duck," and finally she said, "Such, I cannot tell you what it is." She had still greater difficulty in reading her own writing, declaring "It is all wrong"; at the end of a letter to her husband she apologized for her bad writing, saying she could not re-read it.

In the course of investigations extending over a period of three months she made considerable improvement; first her general orientation and her memory became better, and the progress was so rapid that after about six weeks her previous capacities were almost completely restored. Next the amnesic speech defect and the alexia improved, but in both considerable defects were still present; the type of the disturbance, however, was fundamentally the same as at the beginning of the examinations. Finally, only very slight progress was made in calculations.

According to the history given by her husband she used to be a stable person of average intelligence, with an elementary school education; she was very fond of reading, a good writer, and especially good at spelling. She also had some skill in drawing, but she was always poor at figures; she never could do more than simple sums, and this only laboriously. The patient was outspokenly righthanded.

Discussion.

The disorders in this case—excluding the neurological signs—following a subarachnoidal haemorrhage consisted of a severe memory loss with lack of thought material and disturbance in thought process, an acalculia, an amnesic aphasia, word-blindness, and slight errors in writing and occasional spelling mistakes.

The memory and thinking capacities returned to normal after about four weeks, whilst the other defects, though improved, were still manifest at the

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conclusion of our examinations after an illness of three months. It must be mentioned that among the functions affected there were some in which the patient had had a particularly high efficiency and others in which she was poor before the illness; while some functions in which she had a high degree of skill and practice were heavily involved, others remained almost intact. The distribution of functional loss was, therefore, in our case not related to the degree of skill and automatization of particular functions.

In our investigations of the amnesic aphasic disorder, we have considered whether the difficulty in finding words should be attributed to a primary defect in speech or to a more general disturbance. It is hard to deny that there were reactions of our patient which, when considered separately, appear to favour Goldstein's interpretation of a categorical disorder; she had difficulty in finding a reasonable number of representatives subordinated to a definite collective conception; in sorting of colours there was some tendency to Goldstein's primitive behaviour when at the beginning the brightness of the colours interfered with her principle of classification. She was, however, on the other hand, quite capable of thinking in an abstract manner: she could describe the meaning of the collective name for a number of representations, for which she was unable to find the proper expression; she easily grasped the meaning of a short story and could give an abstract of it, and her interpretation of proverbs was prompt and accurate. But, though the trend of her thought was generally correct, she always had difficulty in phrasing it correctly. Special tests carried out to determine the broadness of this defect demonstrated clearly that the same defect was present in the entire field of speech. It became clear, when she had to form as many words as possible from a given initial letter, that at the most she could think of only two or three words. She failed when she had to produce synonyms or antonyms of a given word; characteristically, when asked to find the opposite of ugly, nothing except "not ugly" came into her mind. Also there was a definite change in the way she expressed herself in ordinary conversation and in descriptions; she seemed to use extremely simple language with little variations in her vocabulary, while at the same time retaining the fluency of her speech, even in the first period of the observation. Alterations in the style of speech, however, are difficult to assess without detailed knowledge of a patient's speech behaviour before the suspected change. We know that our patient was relatively well read, and the more she improved the more evidence we found that her potential vocabulary was, indeed, very good. We also had the opinion of her husband, who took a great interest and was an acute observer; he agreed that her speech had become much simpler. The most valuable information on this point was given by the patient herself in an attempt to describe her difficulties, when she said: "They (thoughts ?) come up into my brain and I cannot say them, and I think of the nearest I can say." Speaking in general terms, one can make the statement that the patient's language sank to a lower and more primitive functional level. If we take the spoken word as a result of a psychological process progressing from thought to expression, we can, following A. Pick (1913), distinguish a number of stages, the last of which, preceded by grammatical setting, is the choice of words. Our patient's grammatical setting was perfect, and there

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were no signs that the inner language was at any other point at fault. It was then only in this last stage that the patient failed ; her speech, otherwise well prepared in thought and language, lacked the capacity of choosing or mobilizing the words adequate to the preceding scheme. Under such conditions the speech difficulties should arise whenever the word resources are put to the test : this is, as we have seen, true for our patient. As to the amnesic aphasia in general, it has always been emphasized that the difficulties occur mainly when the patients have to name objects, and that they increase proportionately to the exactness of the answer required. Under these circumstances, indeed, the defect becomes as a rule very marked and can hardly be overlooked. In what way the speech behaviour is altered under other conditions, however, has been little investigated. Only after Goldstein (1926) raised the question of a categorical disorder, were more detailed investigations carried out (Kramer (1928), Wolpert (1930), Scheller (1938), Weisenburg and McBride (1935)). These examinations showed that amnesic aphasic patients are in word-need, whatever verbal situation arises. Wolpert (1930) describes significantly the spontaneous speech of his patient as " uncomplicated and poor in words." Weisenburg and McBride (1935) state that the speech of their amnesic aphasic patients contained a large proportion of ready-made expressions, colloquialisms, and automatic responses. This leads us to the opinion that the amnesic aphasia in its pure form is not mainly a nominal disturbance, but a disorder in which the word material available for the speech process is restricted, its mobilization inhibited. Consequently the language lacks all abundance, has lost its individual style, is poor in formulation, and simple in pattern. This defect becomes more embarrassing for the patient and more manifest to the observer when the patient has to name objects than in ordinary conversation ; to keep up conversation or to describe something in a simple way little resources are needed and substitutions can be used fairly freely. This is, in fact, as we found in our case, what the patients do. This recourse cannot be used when they have to name objects. As their flow of speech can be quite adequate, and as they are able to speak to the point, the broader defect can easily escape the observer.

We have referred to the various stages of verbalization as a basis for the psychological understanding of the problem. As experience shows, the complexity of aphasic disorders cannot be explained solely by this relatively simple scheme. In fact, it cannot be assumed that in the normal process of internal speech the various stages are sharply separated. Much less is it to be expected that a pathological process should select a particular stage with any regularity. Accordingly, cases of focal lesions with aphasia of exclusively amnesic type are rather exceptional, and amnesic aphasic reactions are found much more often as part of various forms of aphasia.

Though we had to come to the conclusion that the amnesic aphasia is not the expression of a general thought disorder of a specific kind, there certainly are close relations between disturbances in thinking and those in word finding. When we consider the course our patient's illness took, these relations are well indicated. At the onset a combination was found similar to that experienced in organic dementia, where the lack of thought material, dominating the picture, could have been made responsible for the amnesic aphasic reactions ;

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it is indeed not easy in such combination to disentangle one from the other. But later, with gradual restitution of the thought process, the amnesic aphasia became more isolated, and more evidence could be collected to prove its independent character. We believe that this sequence of a defect in thought material giving way to an incapacity to mobilize word material is not purely accidental.

Two forms of alexia in its classical meaning, a literal and a verbal form, have been distinguished. Patients with literal alexia (Déjerine (1892), Hinshelwood (1895), Bonhoeffer (1903), Wolpert (1930), *et al.*) are unable to identify letters; in verbal alexia (Dejerine and Thomas (1904), I. V. Paterson (1905), Dide and Botcazo (1902), Bonvicini and Pötzl, Kramer (1928), *et al.*) the identification of letters is comparatively good and the main disturbance is found in the reading of words. There is no sharp distinction between these two types; our case, a verbal alexia, showed many characteristics described in both of them. In accordance with other observations, our patient was unable to copy though able to write on dictation. She was unable to read her own writing and, as she was unable to check writing, it did not make any difference to her whether she wrote with open or closed eyes. It is also a common finding that reading of figures is preserved, as it was in our case. In most cases the patients fail in particular letters consistently; these are often, as in our case, the letter X, those letters which are in little use; the selection is then according to Ribot's rule. But frequently quite common letters may cause special difficulties, as in our case P and R, where a psychological explanation can hardly be given. She did comparatively well with single letters, much worse when a large number of letters were presented to her at the same time, and still worse again when they formed part of a word. The longer the word the more she became confused, and the end syllable usually appeared completely strange to her. As her visual field was restricted, a peripheral cause for this reaction might be suggested; such peripheral factors in word-blindness have been specially stressed by Beringer and Stein. We found, however, that our patient had no difficulty whatever when pictures or objects were concerned; she was able to pick out promptly a particular one from a number of them. There was also a significant contrast between letters and figures; when in one experiment letters and in another figures were dispersed over the same area, she could easily pick out the figures named but not the letters, and had great difficulty with those which she was able to read singly. This defect in the apperception of symbols is therefore selective.

In some respects the reaction is reminiscent of that seen in Pick's (1913) apperceptive blindness, where pictures cannot be apprehended in their totality, and partly of those seen in simultaneous agnosia (Wolpert), in which the patients are able to recognize details without being able to combine them into a whole. The fact that a larger entity of written symbols has a confusing effect upon the patients is also brought out by their reading procedure. It has been noted by a number of authors that the patients in their attempts at reading go along the letters singly with their fingers, or even uncover each letter separately. Our patient showed principally the same approach; in the beginning of her illness she read letter by letter, and she never could be induced to do without this

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procedure. In later stages, when her reading had improved, she succeeded more and more without this help. In her letter-by-letter reading, especially in the beginning of her illness, she often made mistakes in the identification of letters; she then produced the word with these mistakes in it. If, on the other hand, her spelling of the letters was correct, so was the final result. Thus she transferred her visual impressions piecemeal into the sphere of language, so as to come to a total conception of the word, to a "gestalt" which she was unable to obtain by visual gnostic means. This tendency to draw on other resources in order to bridge the functional loss is partly the reason why, as reported, some of these patients with alexia make writing movements with their fingers while reading. These responses demonstrate also how these patients are compelled to replace a simple proceeding by a complicated roundabout way, and how a normally automatic act becomes de-automatized.

The most remarkable reaction of our patient was her ability to interpret words or parts of a sentence without being able to read it; in such circumstances she declared that she could not read at all ("It looks quite strange to me"), or she produced a paraphasia which had not the least similarity to the written word. The paraphasic reading with correct interpretation would not be surprising if the patient also had paraphasias in her spontaneous speech: the internal speech was, however, apart from the amnesic factor, completely intact. One could, with some justification, assume that she came to the meaning of the word by completing words incompletely read; she certainly often guessed, which is well demonstrated by her occasional tendency to confabulation. Though completing and guessing had part in her responses, it is significant that she was under these circumstances never able to produce the actual word, but consistently used definitions and circumscriptions. Only after she had done so might the correct expression sometimes appear. This behaviour is thus strikingly similar to what we have seen in her amnesic-aphasic reactions; though unable to get hold of the expression itself, she grasped the meaning. Although we did not find an identical reaction in the literature of word-blindness, reactions of amnesic type are mentioned in the cases of Hinshelwood (1895) and Wolpert (1930); these authors describe that their patients could often name and identify a written letter only after they had said the whole alphabet up to the particular letter. This suggests that there is a common factor which interferes with the mobilization of the written word as well as with that of the spoken word; this finding provides, at least for some cases, a psychological explanation for the syndromal appearance of amnesic aphasia and alexia.

From the patient's own statement and from our discussion it is, however, quite clear that in the foreground of the alectic picture in our case are those reactions which show that her main difficulties were of the visual agnostic order. It is obvious that in such functions as reading, which is based on speech as well as on visual apperception, both disorders of speech and visual gnostic disorders may produce a defect in function. This is confirmed by clinical experience and has been fully recognized. There are cases of aphasia in which alexia is a predominant feature, and a number of pure alexia in which the word-blindness appears to be a residuum of a general agnostic disorder

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and often minor agnostic disturbances can still be discovered. In cases where an amnesic aphasia combines with word-blindness, an amnesic factor may, as our case demonstrates, be partly responsible for the otherwise agnostic type of word-blindness.

Our patient's approach to the written word was interesting. The procedure of reading became de-automatized, and each written word became a new problem to be laboriously solved. She was unable to approach the word as a whole, and had to build it up from partial impressions. In doing this also her procedure was unusual; she transferred the partial impressions of the visual agnostic sphere into that of language. Disturbances of this kind have often been considered fundamental to the specific disorder; but similar alterations in the working mechanism are found wherever functions of a higher order have disintegrated—for instance, in aphasic and apractic disorders. It is therefore more likely that these are signs of de-differentiation at a certain functional level rather than the basis of a specific disorder.

The last of the more outstanding features of our case which did not tend towards a complete restoration was the acalculia. In a few cases in the literature (Janota and Springlova (1930), *et al.*) calculation disturbances have been found to accompany word-blindness. Our patient is not a suitable case for analysis; her abilities in calculation have certainly suffered, but she was very poor, much below the average, before her illness. Considering the relatively rare occurrence of acalculia in purer cases of alexia, it might well be that the combination of these two disorders is due to the special character of the lesion, as suggested by Springlova and Janota. But we must not forget that with faculties in close functional association the functional loss in one may have an effect upon the other. The intensity of this association depends upon the way the particular function has been built up, and is thus subject to individual variations. We can therefore well imagine that in a person whose calculations are tied up with visual imagery or based on reading procedure, an alexia could secondarily lead to difficulties in calculations. This remains purely theoretical for the acalculia in this case. Such functional interrelations are, however, much firmer between reading and writing and reading and spelling; considering this, it is not surprising that almost all cases of alexia (Hinshelwood's case (1895) which is regarded as one of the purest, is no exception) show some difficulty in writing, and we see also in our case slight uncertainty in spelling; distinguished from the main disorders by the very slight functional loss, they can be regarded as secondary symptoms.

This history of the sudden onset of a comatose condition preceded by headache, together with the finding of a haemorrhagic cerebro-spinal fluid, is suggestive of a subarachnoidal bleeding. The meningeal symptoms of neck stiffness and Kernig found in the examination are signs frequently seen in such conditions; the same applies to the retinal and vitreous haemorrhages, which, moreover, suggest that one of the basal arteries was the site of the bleeding. As the patient did not suffer any injury, a rupture of an aneurysm, either congenital or arterio-sclerotic, was its most likely cause. Uncommon and confusing was the finding of a paresis of both legs, with pyramidal signs and loss of deep reflexes, without any other neurological signs. This is difficult to

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explain as a consequence of brain damage; assuming a lesion of the basal parts of the brain, a paraparesis with the signs mentioned, without involving cranial nerves seems to be unlikely; and again, considering the whole symptomatology, an involvement of the parasagittal region, which could have caused such symptoms, is still more improbable. There remains only the alternative of a spinal lesion, which would offer the easiest explanation. The finding at the lumbar puncture seems to support this explanation. Though no Queckenstedt was carried out at the lumbar puncture, it was noted that during it the pressure of the cerebro-spinal fluid rose only gradually till it reached the high level of 300 mm., and even then the flow of fluid was found to be extremely slow. This paradoxical finding can hardly be explained by intracranial pressure alone. It suggests in our opinion a simultaneous partial occlusion in the spinal subarachnoidal space; such occlusion could prevent the immediate conduction of the pressure present above the block downwards, and could slow down at the same time the flow of fluid. The gradual rising of the pressure would necessarily follow the reduced rate in flow. It seems likely that a blood-clot had been formed in the spinal sub-arachnoidal space after the acute phase of the bleeding, causing the partial occlusion and giving rise to the neurological symptoms. This would also explain why these symptoms took clinically a course different from those which were caused by the brain damage.

As to the damage inflicted inside the cranial cavity, two phases, one more acute and the other more chronic, can be distinguished in the course of our patient's illness. The first consisted of a picture of a general mental disorder, whilst the other was of a circumscribed functional loss. The first started with a comatose condition, which was followed by a state of manic excitement, and this passed into a state of grave memory loss with reduced spontaneity and productivity. As there is every reason to assume that one of the basal arteries had ruptured, the main damage must have been done to the basal parts of the brain. Considering recent observations, it appears not unlikely that the mental picture had been caused by extravasation around the diencephalic region, and that it subsided after the extravasation had been absorbed.

As to the more stationary symptoms, the right-sided hemianopic defect, the alexia and the amnesic aphasia, there is fairly general agreement about the combination of the first two symptoms (Pötzl (1927), Weisenburg and McBride (1935), de Massary (1932)), that the left lingual gyrus in right-handed persons is of crucial importance. Since Déjerine first demonstrated in his case of pure alexia a softening of the basal parts of the occipital lobe, a number of similar clinical anatomical observations have been made (Déjerine, Hinshelwood (1895), Bramwell (1905), Brissaud (1900), Dide and Botcazo (1902), Ehrenwald (1930) *et al.*). The fact that the hemianopia of our patient is confined to the upper quadrant, pointing thus to an interruption of the lower fibres of the optic radiation, is well in agreement with a lesion of basal parts of the brain.

The lesions found in word-blindness are in the distribution of the posterior cerebral artery, or its branches (lingual artery) and involve the occipital temporal region. Pötzl (1927) is of the opinion that the extent and localization of the lesion within this area varies according to the associated symptoms. The syndrome of word-blindness and amnesic aphasia may thus be explained

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in accordance with Foix and Masson (1923) by an extension of the lesion to the temporal lobe.

SUMMARY.

A patient, semi-comatose after a subarachnoidal haemorrhage, passed into a manic state for several days, followed by reduced mental activity with severe memory loss. During this time there was amnesic aphasia, alexia, slight writing and spelling defects, and acalculia. There was gradual improvement, but three months later the special defects were still present, although memory and mental alertness had returned to normal four weeks after the haemorrhage.

At first there was loss of knee and ankle jerks and pyramidal signs, which soon became normal, and a paraparesis of legs, which recovered three weeks later. There was an upper right-sided homonymous quadrantic hemianopia, which remained unchanged.

Results of detailed investigations have been described.

It was of diagnostic importance that paradoxically the pressure of cerebrospinal fluid gradually increased during lumbar puncture with a slow flow, which was probably due to a clot causing partial occlusion of the spinal subarachnoidal space, with co-existing increased intracranial pressure.

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HISTOPATHOLOGICAL FINDINGS IN GENERAL PARESIS AFTER PENICILLIN TREATMENT: REPORT ON 4 CASES.

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THERE have been several deaths during or after penicillin therapy for G.P.I. (Goldman, 1945; Neymann *et al.*, 1945; Weickhardt, 1946, and Rose and Solomon, 1947), but there have been no reports of neuropathological studies. We think, therefore, that it may be of some value to describe the pathological findings in the brains of four such cases.

CASE 1.—A man, aged 56, was admitted to hospital on 14 September, 1945. For about six months he had been somewhat agitated and restless, and had slept poorly. Three weeks before admission he had been questioned by the police because of peculiar behaviour, being sent to a public assistance institution, where he expressed grandiose and persecutory delusions, and was certified as insane.

On admission he was elated, garrulous, and poorly orientated for time and place. His memory was grossly impaired for both recent and remote events. Lips and tongue were tremulous, and he was dysarthric. The blood Wassermann reaction was positive at a dilution of 1 in 8. The cerebrospinal fluid contained 84 cells per c.mm., with lymphocytes predominating; its total protein was 100 mgm. per 100 c.c., the Wassermann reaction was positive, and the colloidal gold curve was 5554433100.

Treatment was started on 29 September. A total of 2,400,000 O.U. of calcium penicillin was given in individual doses of 50,000 O.U. injected intramuscularly every 4 hours. Treatment was interrupted for a short period on 6 October because of an acute exacerbation (interpreted as Herxheimer reaction) in the patient's mental symptoms. It was completed on 7 October. During the succeeding week elation and euphoria disappeared, but grandiose delusions remained. Lumbar puncture was repeated on 22 October. The results were as follows: Cells 37 per c.mm.; protein 5 mgm. per 100 c.c.; Wassermann reaction positive; colloidal gold curve 4553320000. On 29 October the patient developed lobar pneumonia. He did not respond to full doses of sulfamezathine and died on 14 November, 1945, 46 days after the institution of treatment. At autopsy the lower lobe of the right lung was found to be in a state of grey hepatization, with abscess formation at its upper pole.

The brain had been sectioned several times at autopsy before being placed in formalin, so that when received at the neuropathological laboratory it could not be examined satisfactorily from the gross anatomical standpoint.

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Histological investigation of the brain.—All the characteristic changes of general paresis were seen, but their intensity, especially that of the inflammatory process, was much less than is ordinarily encountered in untreated cases. The perivascular infiltration, even in regions such as the frontal and temporal cortex, was nowhere more than mild in degree (Fig. 1). In many cases it was almost completely absent (Fig. 2). Under high magnification it was apparent that while some of the large vessels in the affected regions showed moderate cuffing, the precapillaries and capillaries exhibited only a little, or none. The striate body was minimally involved, and the diencephalic centres, the brain stem and the cerebellum were almost unaffected. Microglial proliferation was likewise much less marked than is ordinarily seen in untreated cases, both in Nissl sections and after impregnation with silver carbonate. The iron reaction was positive in the walls of many small and medium sized cortical vessels (Fig. 3). Spirochaetes could not be found in silver impregnated sections taken from the frontal and temporal regions. Other changes encountered were thickening and fibrosis of the meninges, marginal glial fibrosis, and distortion of the cortical architecture caused by patchy or diffuse loss of nerve cells (Figs. 1 and 2). Many of the remaining nerve cells showed various degrees of acute, severe or chronic degeneration.

CASE 2.—A man, aged 54, was admitted to hospital on 28 February, 1946. Eighteen months previously he had developed tremor of his extremities, had become unsteady on his feet and unable to go to work, and had discontinued all social contacts. For two months before admission his condition had gradually deteriorated.

On admission he was demented and euphoric. His memory for recent events was grossly impaired, and there was evidence of auditory hallucinations. He was in a poor physical condition, with heart sounds of poor quality, and arteriosclerosis of the peripheral vessels. The blood Wassermann reaction was positive at a dilution of 1 in 8. The cerebrospinal fluid contained 17 cells per c.mm., mostly lymphocytes; the total protein was 150 mgm. per 100 c.c., the Wassermann reaction was positive, and the colloidal gold curve was 5555544110.

Treatment was commenced on 5 March, 1946, and consisted of a total of 2,400,000 units of sodium and calcium penicillin in individual doses of 50,000 units injected intramuscularly every 4 hours. It was completed on 13 March. Immediately following this he showed mental and physical improvement. His mood became normal; the tremulousness of the limbs was diminished, as evidenced by improvement in handwriting and walking. His auditory hallucinations were less marked. On 27 March examination of the cerebrospinal fluid showed 17 cells per c.mm., 90 mgm. protein per 100 c.c., Wassermann reaction positive and colloidal gold curve 5555553200. A second course of intramuscular penicillin, identical with the first, was given between 27 March and 4 April, 1946. Thereafter he showed further improvement; his handwriting was better, his gait improved, and his hallucinations of hearing disappeared. Lumbar puncture on 20 May showed 4 lymphocytes per c.mm. and 60 mgm. of protein per 100 c.c.; the Wassermann reaction was positive and the colloidal gold curve 5555543100. On June 21 his physical condition began to deteriorate, and he died on 28 June, 1946 (i.e. 108 days after the start of treatment).

Post-mortem examination revealed atheromatous and syphilitic involvement of the aorta. There was well-marked coronary sclerosis and fatty degeneration of cardiac muscle, and the liver showed severe chronic venous congestion. The brain weighed 1,150 gm. The meninges over the convexities were slightly opaque, and there was marked atrophy of the convolutions, particularly in the frontal lobes. The arteries of the base were normal, the lateral ventricles moderately enlarged.

Histological investigation of the brain.—The pathological changes were the same in kind as in Case 1, but more widespread and slightly more severe. Under low magnification some cortical areas, particularly in the central region (Fig. 4), showed little, if any, inflammation. In the frontal and temporal regions moderate perivascular cuffing was present (Fig. 5). The occipital lobes and the striate bodies were a little involved, and the globus pallidus, thalamus, brain stem and cerebellum only very slightly. Under high magnification precapillaries and capillaries were seen to be somewhat more heavily infiltrated (by both plasma cells and lympho-

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cytes) than in Case 1. The meninges in all regions were thickened and fibrosed, and infiltrated mainly by lymphocytes. Loss of nerve cells, sometimes diffuse, sometimes more circumscribed, was seen in frontal, temporal, and even occipital cortex. The remaining nerve cells had lost their polarity, and displayed changes resembling mainly the acute and severe types of degeneration. In the motor cortex " chronic " cell change predominated, most of the pyramidal cells being shrunken, with triangular pyknotic nuclei ; the Betz cells were laden with lipofuchsin. The loss of nerve cells resulted in general disturbance of the cytoarchitecture, as shown in Figs. 4 and 5. Microglial proliferation was slightly more intense than in Case 1. The iron reaction was more intense and uniform than in Case 1, being strongly positive around the blood vessels of the cortex and the striate body. In silver impregnated preparations no spirochaetes were found after a lengthy search of sections taken from the frontal and temporal lobes.

Case 3 was a young woman, aged 27, of no occupation, admitted to hospital on 13 July, 1946. She was probably a case of juvenile general paralysis, although the evidence is not conclusive. She had been sociable and cheerful until the age of 21, when she began to show a character change, becoming bad-tempered and quarrelsome.

On admission she was disorientated for time and place, negativistic and difficult to examine physically. She was retarded in thought, and her memory for recent events was poor. She lacked insight into her condition, and harboured grandiose delusions. Her physical condition was poor, with decubitis ulceration of trochanters and sacrum. The blood W.R. was positive in 1 in 8 dilution. The C.S.F. gave a strongly positive W.R. (+ + +) ; the protein was 60 mgm. per cent. ; the cells 1 (lymphocyte) per c.mm. ; and the Lange was 5555554210.

Injections of 50,000 units of penicillin, intramuscularly, were commenced on 1 May, 1946, being repeated every 3 hours until 13 May, 1946, when a total of 4,850,000 units had been given. No C.S.F. investigation was carried out following treatment. She died on 30 May (i.e. 30 days from the start of treatment), after rapidly deteriorating both mentally and physically.

Post-mortem examination revealed no noteworthy changes in any organ except the brain, which weighed 1,040 gm. and which showed a moderate degree of generalized convolutional atrophy. The meninges were slightly opaque over the frontal regions, and the ependyma of the enlarged lateral ventricles gave the appearance of mild frosting. The basal arteries appeared normal.

Histological investigation of the brain.—Inflammatory changes were severe in the frontal, central and temporal regions, moderate in the occipital lobe and striate body, and slight in diencephalic centres, midbrain, brain stem and cerebellum. The meninges were everywhere greatly thickened and infiltrated. The small vessels in the cortex displayed the typical paretic picture of " wall-papering " by plasma cells. The cytoarchitecture of the occipital and, to a lesser extent, the central cortex was fairly well preserved, but frontal and temporal cortex showed diffuse outfall of nerve cells, particularly in the third layer, and much disorganization due to loss of polarity. Microglial proliferation was intense throughout the cortex and was also prominent in the white matter. " Frosting " of the fourth ventricle was conspicuous. There was some infiltration of the cerebellar leptomeninges and marked vascular cuffing and proliferation of microglia in the region of the dentate nucleus. The iron reaction was appreciably stronger than in the two preceding cases. Deposits in both microglia and adventitial histiocytes of vessels were widespread, being specially abundant in the frontal and temporal lobes. Careful search revealed no spirochaetes in silver-impregnated sections from frontal and temporal lobes.

Case 4, a youth, aged 20, was admitted to hospital on 5 June, 1946, having been for some months in a poor mental and physical condition.

It was reported that in 1934 at the age of 9 he had been discovered to possess a positive blood W.R. and had received anti-syphilitic treatment. At 17 he had collapsed, remained unconscious for some time, and had been admitted to the Manchester Royal Infirmary. The essential findings at this time were : Fixed pupils, variable strabismus and nystagmus, and diminution of all deep and superficial reflexes. The cerebrospinal fluid showed a paretic gold reaction (5555421100),

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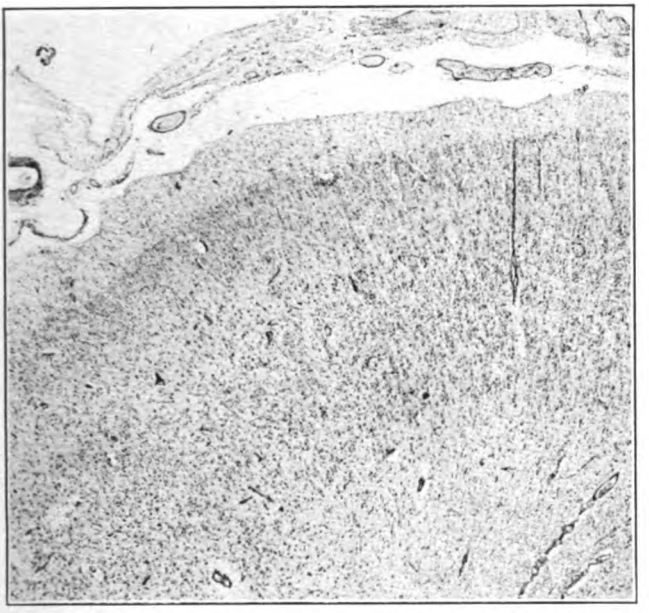

FIG. 1.—Case 1 : Frontal region showing mild inflammation in the meninges and cortex, and distortion of cortical architecture. Nissl stain. × 22.

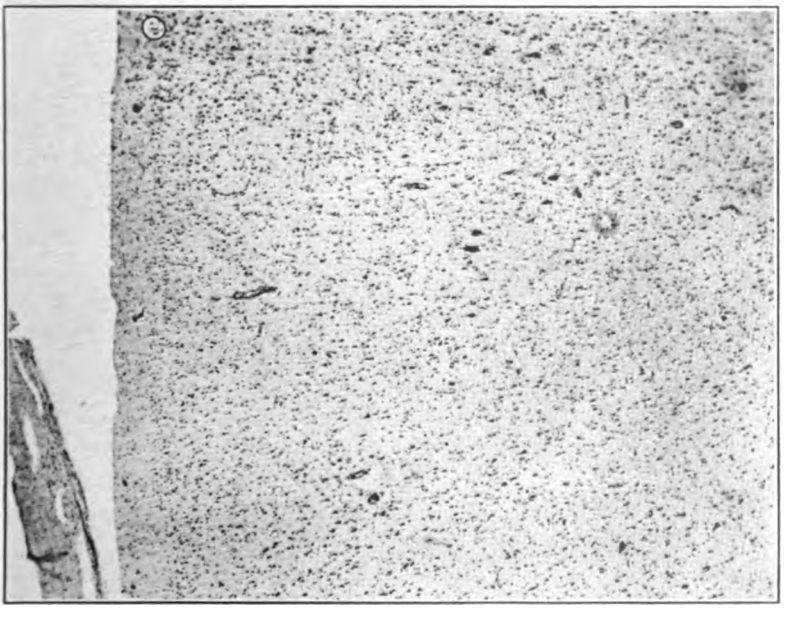

FIG. 2.—Case 1 : Precentral cortex showing almost no inflammation but a diffuse loss of nerve cells. Nissl stain. × 26.

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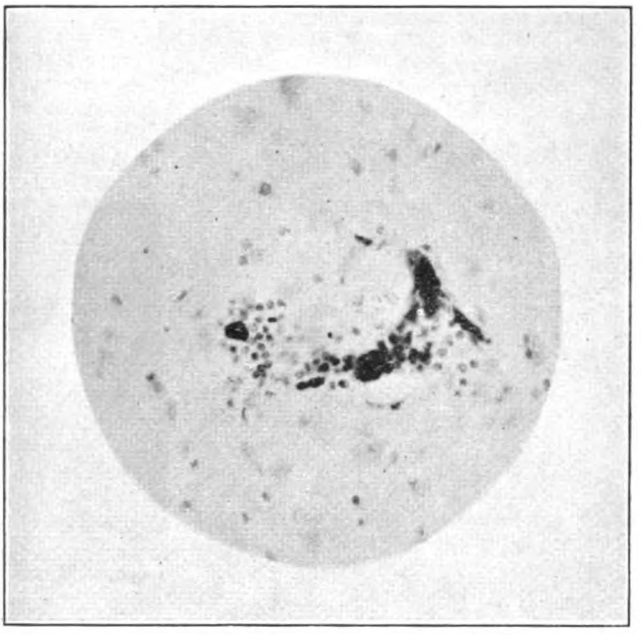

FIG. 3.—Case 1 : Positive iron reaction around a vessel of the frontal cortex. Turnbull stain. × 400.

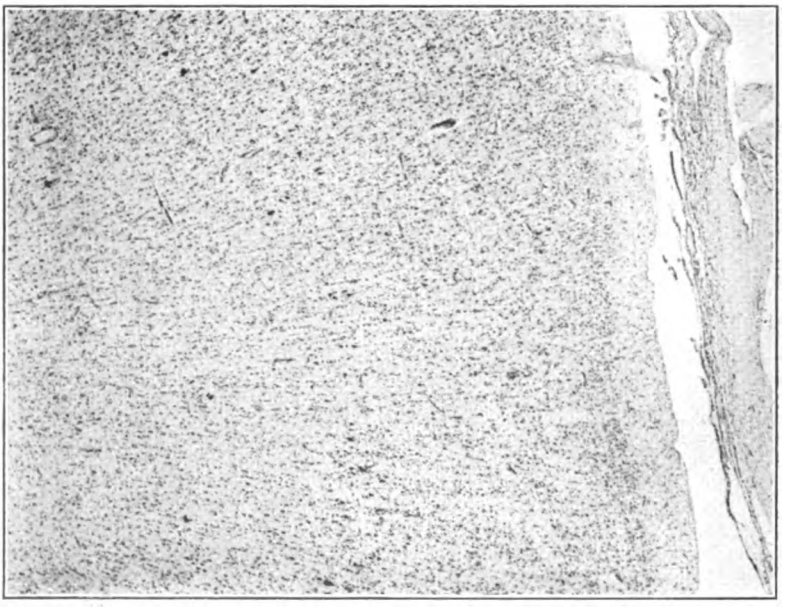

FIG. 4.—Case 2 : Precentral cortex displaying almost no infiltration, but a disturbance of cytoarchitecture. The meninges are thickened and mildly infiltrated. Nissl stain. × 26.

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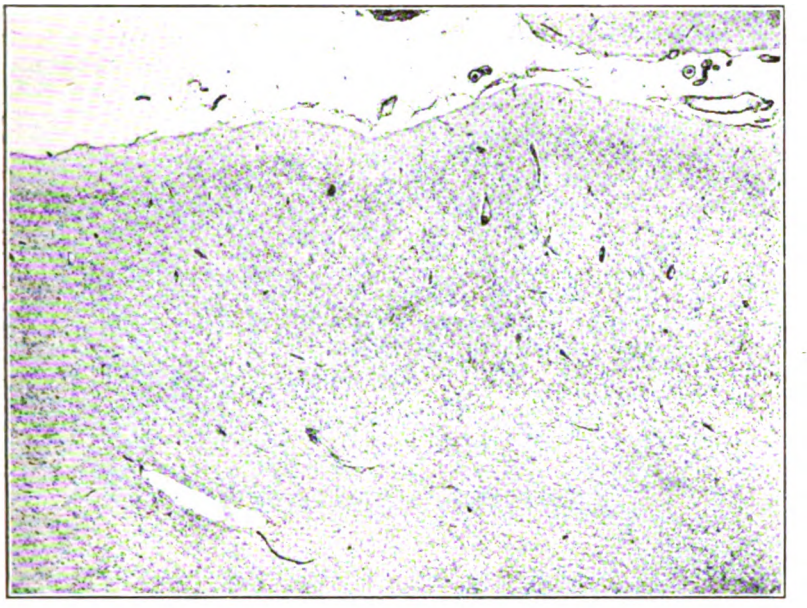

FIG. 5.—Case 2: Frontal cortex showing moderate perivascular cuffing and diffuse loss of nerve cells. Nissl stain. × 20.

FIG. 6.—Case 4: Occipital region showing heavy infiltration, more severe in the white matter than in the cortex. Nissl stain. × 19.

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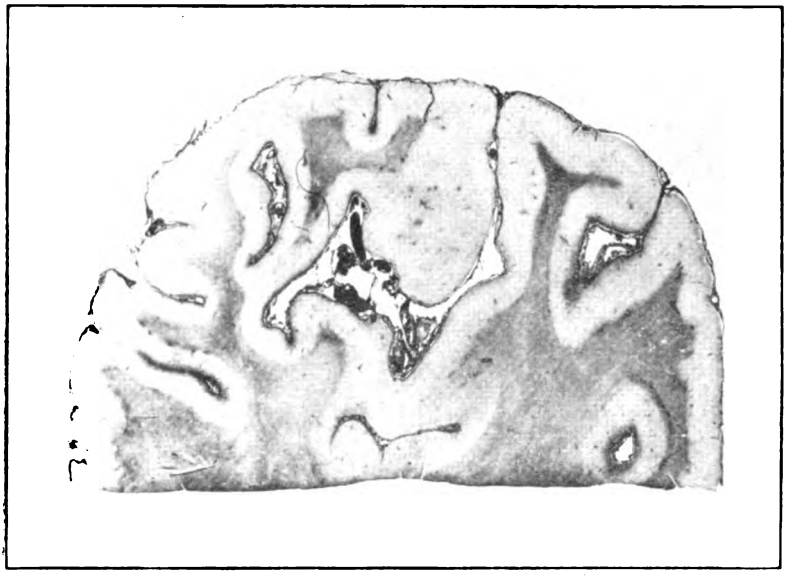

FIG. 7.—Case 4 : Intense fibrous gliosis in the white matter of the occipital lobe. Holzer stain. × 2·8.

FIG. 8.—Case 4 : Temporal region showing gross laminar necrosis of the third layer. Nissl stain. × 8.

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a positive W.R., 30 cells per c.mm., and a total protein of 40 mgm. per 100 c.c. Between 1934 and 1946 he was treated with arsenical and bismuth preparations.

On admission he was in a state of profound dementia. He lay curled up in bed, made champing noises with his teeth, chewed at the bed-clothes, and was completely inaccessible and resistive to attention. Neurological examination revealed continuous lateral nystagmus and complete blindness. There were contractures of the lower limb with absent tendon reflexes. The upper limb reflexes were sluggish, the plantar reflexes extensor. The Wassermann reaction of the blood was positive at a dilution of 1 in 8. The cerebrospinal fluid contained three small lymphocytes, and 65 mgm. of total protein per 100 c.c.; its Wassermann reaction was doubtful; the colloidal gold curve was 5555531100. The diagnosis of juvenile general paralysis was made.

Commencing on 8 June, 1946, 50,000 units of penicillin were given intramuscularly every four hours, up to a total of 2,400,000 units. During and after treatment no improvement was apparent. He gradually deteriorated further, both mentally and physically, and died on 13 August, 1946, 66 days from the start of treatment. Cerebrospinal fluid removed after death gave a paretic gold reaction, but owing to contamination with blood the cell count and the protein estimations were not done; its Wassermann reaction was doubtful.

A post-mortem examination revealed no noteworthy changes in any organ except the brain. It weighed only 1,020 gm., but exhibited no circumscribed atrophy of convolutions. The pia showed considerable opacity and venous congestion in all regions. The basal arteries appeared normal.

Histological examination of the brain.—The regions most severely involved by inflammatory changes were the occipital and temporal lobes. Frontal and central cortex and striate body were distinctly less affected, and globus pallidus, thalamus, brain stem and cerebellum were only moderately involved. The meninges over the convexity were very densely infiltrated with plasma cells and lymphocytes. In the occipital lobe the perivascular infiltration was uniform, very severe, and predominated in the white matter (Fig. 6). High magnification revealed that the infiltration consisted mainly of plasma cells. In Weigert-Pal preparations a fine mottled demyelination was apparent in the white matter of this region. Holzer preparations revealed intense fibrous gliosis in the white matter (Fig. 7). There was no conspicuous outfall of nerve cells, but the cortical stratification was much deranged. In the other regions of the brain the white matter was only very moderately involved, and the inflammatory changes predominated in the cortex. In the temporal lobe there was gross laminar necrosis of the third layer (Fig. 8), extending in some parts to the second and, to a lesser extent, the fourth layers. In the third layer there was conspicuous glial proliferation consisting chiefly of hypertrophic astrocytes and microglial cells. The nerve cells of all layers displayed unspecific cell changes and much disorganization. Some of the remaining nerve cells of the third layer showed a picture very close to "ischaemic cell change." Occasional areas of focal outfall in the third layer occurred also in the central and frontal cortex. The microglial cells were hypertrophic and intensely proliferated throughout the cortex, and also in the white matter of the occipital region. This proliferation was considerably more severe than in any of the preceding cases. The iron reaction was strongly positive in microglia as well as in adventitia in all parts of the brain, including brain stem and cerebellum. In the occipital lobe iron deposits predominated in the adventitial cells of the vessels of the white matter. Other changes encountered were subependymal proliferation of the glia in the fourth ventricle and some marginal gliosis in the cerebellum. No spirochaetes could be found after careful search of several sections from the frontal, temporal and occipital lobes.

Discussion.

The optimum dosage of penicillin in the treatment of G.P.I. has not yet been established, but the total amounts used in our cases would certainly be regarded, according to the latest views (Worster-Drought, 1947; Rose and Solomon, 1947), as insufficient. Again, in such a chronic process as G.P.I. no reliable assessment of a new treatment can be made without a follow-up

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study of many years. It is obvious, therefore, that no final conclusions regarding the merits of penicillin therapy can be drawn from this small number of cases, so limited in their dosage and in their duration of post-therapeutic survival. Nevertheless, the two improved cases, at least, provide interesting comparison with malaria-treated cases.

There is general agreement that in cases arrested by malaria, as evidenced by clinical stabilization and the return of the spinal fluid towards normal, there is histopathologically little or no evidence of inflammation, the extent of cortical damage depending on the stage at which the illness was treated (Wilson, 1928; Jahnel, 1930; Stern, 1932; Galbraith, 1938; and Stengel, 1945). The moderate degree of infiltration found in our two clinically improved cases (1 and 2) is distinctly below the average for untreated G.P.I., and is, indeed, very comparable to the state of affairs found after successful malarial treatment. The two clinically and pathologically unimproved cases (3 and 4) were both of a juvenile G.P.I. type of long standing, with a prognosis equally poor with malaria therapy. In Case 4 the prominence of focal symptoms in the clinical history, the severe involvement of the cortex and white matter of the occipital lobe and the laminar necrosis in the temporal cortex all suggest that this was probably a case of the Lissauer type. It bears some resemblance to the one reported by Galbraith and Meyer (1942), and, as these workers pointed out, the absence of epileptic convulsions and of macroscopic atrophy does not necessarily exclude such a diagnosis.

In Cases 1 and 2 there was a fairly clear correlation between the clinical and the pathological improvement, and also the decline of cell and protein contents in the C.S.F. This is in good accord with the fact that after penicillin treatment the most striking improvement in the C.S.F. has been found to occur in the cell-count and the protein content (Gammon, 1945; Stokes, 1945, 1946; Rose and Solomon, 1947). Rose and Solomon in their careful follow-up of 100 cases showed that in the majority the cell count returned to normal during the first 3 to 6 months, while the protein content took from 6 to 9 months to return to normal. The colloidal gold and Wassermann reactions improve more slowly in a smaller percentage of cases (Smith, 1947; Rose and Solomon, 1947).

The fact that, in spite of careful search, no spirochaetes were found in any of our cases, although by no means conclusive, is probably significant. In untreated cases, when the silver impregnation method is used, spirochaetes are found in 62·5 per cent. of cases (Grant and Kirkland, 1927). After malaria treatment it is very difficult to find any. In Wilson's (1928) series of 38 cases they were present in 6, 5 of whom had died during a period of clinical recrudescence; in all of them the inflammatory changes were very severe. Stern (1932) in 24 brains of malaria-treated paretics was able to find spirochaetes only in 2. (See also Jahnel, 1930.)

As regards the iron reaction, although not very marked in Cases 1 and 2, it was on the whole indistinguishable from the findings in untreated cases of G.P.I. According to Wilson (1928), this reaction persists following malarial therapy, although it is perhaps somewhat decreased; it may even undergo a later period of exacerbation, but other workers (Galbraith, 1938; Stengel,

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1945) have demonstrated its disappearance in patients who had died long after successful malarial treatment.

The possibility of penicillin producing an initial exacerbation of the inflammatory process, as has been recorded in malarial therapy (Straussler and Koskinas, 1923, 1925; Gurewitsch, 1926; Freeman, 1927; Wilson, 1928; and Galbraith, 1938), is raised by Cases 3 and 4, whose clinical course was certainly not retarded.

The exacerbation of mental symptoms seen on the eighth day of treatment in Case 1 is reminiscent of a similar temporary relapse accompanied by fever and confusion in one of a non-fatal series reported by one of us (Smith, 1947), and was presumably a Herxheimer reaction. It seems unlikely that it could have been due to the irritative action of penicillin, for this has not been reported except following intrathecal injections (Walker and Johnson, 1945; Russell and Beck, 1945). No C.S.F. examination was, however, carried out during the episode. The Herxheimer reaction is associated usually with a temporary increase of lymphocytes (Rose, 1945), whereas the irritative effect is accompanied by a great number of polymorphs (Bittencourt and Canelas, 1945).

Summary.

Four cases are reported of general paretics who died some weeks after parenteral penicillin treatment (total dosage: 2,400,000 to 4,800,000 units).

Two of the cases had improved clinically as well as serologically. Histological examination of the brain of these two cases revealed inflammatory changes which were distinctly less intense than in the average untreated general paretic. The iron reaction was positive in all cases, but least intense in Cases 1 and 2. No spirochaetes were found in any of the four brains. These findings closely resemble the state of affairs found at comparable times after treatment of G.P.I. with malaria.

The two clinically unimproved cases were of the juvenile type of G.P.I., one of them a Lissauer type. They deteriorated rapidly following treatment, and showed no mitigation of the inflammatory reaction.

In one case at least there was a Herxheimer-like reaction.

The two improved cases suggest that treatment by penicillin alone is capable of influencing the pathological progress of general paresis.

Acknowledgments.

We are much indebted to Dr. Alfred Meyer and Dr. Turner McLardy for their help and criticism in the preparation of this report.

Our thanks are also due to Dr. J. D. Silverston, Medical Superintendent of the County Mental Hospital, Lancaster, for permission to publish the clinical notes of the cases, to Professor S. Nevin, for facilities to carry out the histopathology, and to Dr. W. R. Rosanoff, U.S. Public Health Service, who originally investigated the pathology of Case 1.

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SOME OBSERVATIONS ON THE ANALYTICAL GROUP TREATMENT OF A PHOBIC PATIENT.

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INTRODUCTION.

THE therapeutic factors operative in group treatment are still partially controversial, and further investigations are necessary to clarify their nature, mode of action, and range of curative potency.

In this paper the response of an individual patient to group treatment is examined in detail to gain further evidence of therapeutic group dynamics.

The technique employed was mainly analytical, and seems to have been similar in its main aspects to the group practices described by Foulkes (1944, 1946) and Ackerman (1943, 1946). The group consisted of 7–9 male patients, who met once a week for 1½ hours in an out-patient clinic. The patients had been treated individually for varying times prior to their admission to the group, but they had no individual sessions during their course of group attendance.

The author took shorthand notes during the group meetings, to have an approximate record of the contributions by the various patients. He avoided taking the lead in discussions, or giving lectures on psychopathology. He took, however, a hand in guiding the conversation and in clarifying those problems of motivation which had been considered or exhibited by the group. Individual interpretations or directives were only rarely given, and they chiefly took the form of applying a discussed problem to the particular circumstances of one or the other patient.

The patient whose case will be presented has been selected for the purpose because his group response was in significant contrast to his reaction to individual treatment and manifested certain therapeutic factors with unusual clarity.

INDIVIDUAL TREATMENT.

Mr. Tenn was 38 when he came to the out-patient clinic for treatment. He was seen in 19 individual interviews at weekly intervals.

He had been brought up in a puritanical and religious household. Up to the time of his marriage at 26 he had felt timid and shy in female company, and had therefore avoided it. He used to spend his holidays with male friends, and it was on the return journey from his last holiday as a bachelor that he first experienced anxiety and nausea during a long bus ride. This marked the beginning of a travel phobia which was originally restricted to holiday trips. In the course of three years the phobia spread; anxiety symptoms occurred even on short everyday journeys and he felt panicky in enclosed crowded places. He was forced to restrict

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his social life, to give up his functions as an elder of his church, and had been unable to attend a religious service for over ten years. He was handicapped in his occupation, which necessitated a fair deal of travelling. He had received various forms of medical treatment for supposed cardiac illness and hyperthyroidism.

For many years he had been tormented by " rotten thoughts," which he tried to suppress by deliberate efforts to recall religious themes and Bible texts. These rotten thoughts consisted chiefly in fantasies of a " dream wife " with three girl children. He imagined perverse sexual practices with these children or with other adolescent girls whom he happened to meet in the streets. He would think of undressing them, of beating their naked bodies, and finally of having sexual relations with them.

His masturbation in adolescence had occasionally included practices of anal stimulation about which he felt particularly guilty. In this respect he recalled that, as an infant, he had been given soap suppositories by his mother, and these had been pleasurable experiences. He had also felt a certain amount of pleasure when his buttocks were smacked as a child.

His paternal grandmother had suffered from a temporary melancholic illness in old age. There was no other family history of mental abnormality. His father, who was still living, was a very religious man and had been a strict disciplinarian. He had often beaten the patient, even to the point of bruising his face. His mother, about whom the patient had little to say, died of a breast cancer when he was 11. There was an older brother and three younger sisters in the family, and these siblings were described as slightly nervous. His sisters had also received frequent beatings from the father, but the patient felt that the father had shown more affection for them than for him. He was vaguely aware that there might be an association between his fantasies of beating adolescent girls and his father's attitude to his younger sisters.

He had been a timid child, afraid of criticism and ridicule. As a boy he had sung in a church choir, but had to give it up because of stage fright.

His occupational career had been successful. He was a conscientious worker and had always been very careful with his money. He was inclined to be argumentative, and could not tolerate making mistakes or being in the wrong.

He was married and had two children (a boy of 11 and a girl of 8). In dealing with his children he tried to avoid imitating the over-strict attitude of his own father, but was aware that he often failed.

During the course of his individual treatment Tenn was eager to unburden himself and to confess his guilt-charged fantasies. He derived some relief from the feeling that his confessions were accepted with tolerance and understanding, but his symptoms remained unaltered.

Group Treatment.

After four months of individual treatment he joined a therapy group which was being formed at the time, and remained a regular member of it for about 14 months. He was always very punctual in his attendance, and only missed occasional group meetings through illness or during his holidays.

His attitude to the group was at first reluctant and defensive. He invariably waited for other members to introduce topics of discussion. When he joined in the conversation he remained hesitant and laconic. At the eighth group meeting he stated frankly that he had preferred individual treatment and had derived more benefit from it. He added, however, " Perhaps both forms of treatment should be combined."

Nine weeks later he had developed a more positive attitude to the group. He looked forward to the meetings from them on and declared that they had improved his condition in some ways. He had become more tolerant towards other people and less argumentative.

After eight months of group treatment he formulated his feelings in these words: " We meet on common ground here. If you talk to an outsider, they have no feeling for your complaints. Here we can talk freely to fellow-sufferers."

But even at that time Tenn had not been able yet to reveal his anal-sadistic tendencies to the group except for a guarded intimation of them at the seventh meeting. During that meeting a member mentioned his mixed feelings of pleasure

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and fear on seeing horses beaten. Tenn responded to this clue and related, with marked anxiety, that he had a fantasy of being married to a dream wife with girl children and that he had pleasurable thoughts of beating them. He gave no further details and replied evasively to questions. His remarks gave rise to a short general discussion on sadism in which Tenn took no part. Another member then admitted indulging in masochistic thoughts, and put the question to each member in turn whether they had " active or passive " sexual fantasies. Tenn's brief reply was: " 75 per cent. active and 25 per cent. passive."

When other sexual topics, such as masturbation, were considered by the group, Tenn offered only sketchy and diffident contributions. He excused this by saying that sex had been a prohibited subject in his youth, and it had always been difficult for him to talk about it.

He was obviously inhibited in his communications to the group by a dread of social censure. This social anxiety, it was soon learned, was not restricted to the group situation. His travel phobia was more intense when there was a possibility that people might notice his anxiety. He always tried to secure an empty compartment, and if this was not possible, he would either wait for another train or take great care not to get into any conversation. From time to time he even changed the station from which he travelled to his office every morning so that he could not become familiar with anybody.

He also mentioned that his earliest social anxieties had occurred in connection with church activities, first, when he was a choir boy, and later when he took Sunday School classes. It was the dread of a punishing God which debarred him from going to church. It also prevented him from visiting cinemas, as the atmosphere there reminded him of a church, and the light coming from the projector was to him a menacing " unseen but all-seeing eye."

Group discussions brought to light that Tenn also harboured fears of being physically handicapped, due to " guilty acts." He felt his body was abnormally lean, and he was so self-conscious about it that he had never been able to go swimming, nor had he weighed himself for years. On one occasion, when two members with some knowledge of popular psychoanalytical literature mooted the question of " castration fears " and expressed their doubts about the meaning and value of this concept, Tenn remarked that such fears might be present in some people who had been threatened by their parents that their penis might fall off if they " touched themselves." This was a general remark with no personal reference, and it was only months later that Tenn admitted that he had attributed his leanness to acts of masturbation. At that time he also disclosed a fear that his penis was " not strong " because of these sexual practices in his youth.

After five months of group treatment Tenn was stirred up by a discussion to admit some sexual peccadillos of his childhood. Another patient had related an incident which Tenn regarded as an example of sexual curiosity in a child. He had also been curious about sexual matters when he was young and had felt very guilty about it. In the course of the subsequent debate he posed the general question how a child would react if it acquired knowledge of parental intercourse. There were several contradictory replies, but Tenn did not indicate his own opinion. At the next group session he volunteered information about an incident of his childhood which he characterized as due to sexual curiosity. He had passed water in front of one of his sisters and had been severely punished by his parents when they learned about it.

On several occasions Tenn spoke of his attitude to his father. He had feared, despised and disliked him, and he could not help being afraid of him still. He had been jealous of the father's affection for his sisters, and he had felt guilty in consequence. He had never been conscious of a similar hostility to his mother. In these and similar discussions it was apparent that he gained some understanding of the parental role in the development of personal standards of morality and the emergence of guilt feelings.

In his overt attitude to the therapist hardly any signs of resentment or hostility were noticeable until the 30th meeting (after eight months of group treatment). He then joined, for the first time, in criticism levelled against the therapist, and revealed that he had repeatedly been annoyed by the latter's avoidance of direct replies to questions and refusal to give advice in practical matters. He had also felt that the therapist showed preference to certain members of the group.

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At the following meeting Tenn took the lead by advocating greater honesty in disclosing embarrassing thoughts, and particularly fantasies of a sexual nature. "We have made an attempt once or twice, but it was either towards the end of a meeting or the subject got brushed aside. We must bring out what we feel shy of." He followed this up presently by the first group confession of his desire for anal stimulation. "When I have intercourse there is a feeling in the back passage that something should be pushed up and down there." In his adolescence he had once, behind a bush, relieved his bowels in the presence of a girl cousin and had experienced an erection at the time. He also mentioned that his mother had applied soap suppositories when he was about three, and that this had caused pleasant sensations. When he got older he wanted to do this to one of his sisters. He felt very ashamed about these desires.

This confession aroused surprise and disbelief in other members. It certainly would be an unpleasant experience to have an object inserted into one's rectum. Tenn was uneasy, but reiterated that he would find it pleasant. He was relieved when the patient X— came to his support, who had also noticed agreeable sensation after suppositories and enemas. X— asked the group whether they had never experienced a pleasant feeling of relief when they had a bowel motion after a period of constipation. This was admitted, but, unlike Tenn, they had never had such feelings when they were sexually stimulated. The problem then arose whether such rectal sensations had any association with sexual feelings. Tenn and the other patient were inclined to affirm this; they had both frequently noticed a tendency to have an erection during defaecation.

After this meeting Tenn felt better for a time and began to lose his anxiety in cinemas. His travel phobia remained, however, unchanged.

A month later Tenn was able to unburden himself further. He gave a full account of his sexual and sadistic fantasies about adolescent girls. Recently he had also dreamt of having sexual relations with a little girl friend of his young daughter. The dream had been so vivid that he had an emission. He felt wicked and evil for having these fantasies, and was afraid he might one day put his sadistic thoughts into action. He was unable to account for these desires. "I had three sisters—all younger than me. That may perhaps explain it." The fantasies started when he was 17. He had then deliberately indulged in them to relieve his anxiety when meeting people in authority. Towards the end of the discussion the therapist pointed out that the bodies of adolescent girls are boyish in certain respects, and that the combination of immature feminine and masculine features might be particularly attractive to certain persons. Tenn admitted the feasibility of this suggestion.

At the next meeting this last point was again taken up and led to a consideration of non-sexual friendships between men. This discussion referred, however, mainly to a close friendship that had sprung up between X— and another patient. Tenn had found no fellow-sufferer with regard to his sadistic leanings. He even learned that he had been the subject of some derisive remarks made by one of the participants, who was frequently aggressive and tactless. When this was mentioned, the other patients were anxious to show their disapproval of such insulting rudeness, and to reassure Tenn of their sympathy and respect. They knew from personal experience how painful and embarrassing it was to reveal such intimate thoughts, as Tenn had done. Surely he felt better after getting "things off his chest." But Tenn was hurt: "You don't want another person to think he is a dirty-minded swine."

Tenn's beating fantasies increased during the following weeks. He was tormented by them day and night, and became irritable and dispirited. It took seven weeks before further significant material was elicited from him. Another member mentioned a childhood episode when he had felt sexually stimulated on handling his mother's underclothing. This incident had been related before, when Tenn had shown no apparent interest in it. This time, however, he responded: "Curious you should mention this. It came back to me just then—when I was 10 and my mother was ill, she asked me to get some knickers for her. I went and fetched them from her bedroom. It was the first time that I realized women wore such things. I knew my sisters did, but I had no idea what my mother was wearing."

The therapist gave an individual interpretation at this point, although there had been no general group interest in this subject. He suggested that Tenn's

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desire to undress young girls may possibly have originated in an earlier desire to know what his mother looked like undressed. This interpretation was seemingly ill-timed ; Tenn had no opportunity to register his response, as the discussion moved on, and it was later learned from him that he had completely forgotten that this interpretation had ever been made.

At the following meeting Tenn reported that he had felt " immensely better since last week." He had even managed to go to church on the previous Sunday without feeling very uneasy. But his sadistic thoughts were as troublesome as ever.

A week later a casual remark by Tenn revealed that his attitude to his father had undergone a fundamental change. Whereas he had previously thought of his father as particularly harsh to him, he now asserted that the father had been stricter to his brother and sisters than to him.

At this stage of his treatment Tenn began to experience a temporary mitigation of his travel fears. One day, when he was alone in a railway compartment, he felt so well that the thought occurred to him he would like to travel for hundreds of miles like that—a thought which would have frightened him previously. This improvement was, however, short-lived and, furthermore, he had never lost his anxiety of crowded compartments. He wondered whether the presence of people intensified his symptoms, because he somehow had the feeling they would condemn him for his sadistic fantasies, which continued to worry him constantly.

At the 51st meeting the topic of homosexual feelings was introduced by the therapist after X-- had reported how upset he had been over a temporary illness of his friend. Tenn remarked that homosexual feelings seemed to exist frequently among schoolboys. An older boy would often make a great fuss of a younger one. When questioned about this statement, he added that this was done " in a kind of fatherly attitude."

X— refuted that any such feelings could be attributed to him ; homosexuality had always revolted him. But after some discussion he stated that he had recently been " trying to imagine what it must be like for a woman to receive advances from a man." This prompted Tenn to the confession : " I have often wished to be a female during intercourse, and the woman should do the work."

During the subsequent weeks Tenn reviewed again his relationship to his father, and gave evidence that he had gained an objective and realistic understanding of the latter's influence on his character development. It had made him strive for an unattainable ideal of perfection, impatient with his own shortcomings, and oversensitive to criticism. He had now learned to be more tolerant with himself and others. At the same time it became noticeable that his behaviour in the group frequently exhibited an air of paternal benevolence to younger members.

At the 55th meeting Tenn reported that his anxiety in crowds was showing signs of abating. He had been to a dance and even to a basement teashop without undue discomfort.

At the following session he announced that lately he had not been troubled by sadistic fantasies ; masochistic urges had, however, taken their place. His desire was now to undress in front of a woman and to be beaten by her. The group was puzzled by this new symptom. How could it be pleasurable to be beaten, even if it was only in imagination ? The word perversion was mentioned, and Tenn turned to the therapist to be reassured that he was no pervert. A brief explanation of the difference between perversion and neurosis relieved his evident embarrassment. He then asked whether these new urges were connected with his interest in anal pleasures, and was given some information of the connection between anal desires and tendencies to hurt other people or to be hurt by them. It was emphasized that such tendencies were not at all uncommon. Tenn concluded this episode with the statement : " I am sure other people also have the urge to hit someone or to be hit. Only in their case it may take other forms. Why does a person nag, for instance ? Because they like to cause distress to another person. They have not got a stick, but it is the same." He never mentioned his masochistic urges again in the group.

The next week he declared that he was feeling so well that he would like to terminate his group treatment gradually by only attending at fortnightly intervals in future. He was present at four more sessions at intervals of up to seven weeks.

At the end of his group treatment his fear of crowds and of company had com-

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pletely disappeared. He now enjoyed going out and meeting people. He had even started to play the church organ again at children's services. On one occasion he had given a lecture in a closed and packed room and had felt no discomfort.

His travel fears had not responded so satisfactorily. He told the group: "I can stand the usual journeys now, but I don't like journeys to an unknown place. Even then I have not got the terrific panic I used to have, when you feel you have to smash the window to get out. I don't run up and down the train now to see if I can find an empty compartment. I just get into the first one, whether it is empty or not. But I still shirk long journeys." He was, however, unable to go by train to the seaside place which he chose for his next holiday, and had to cycle there. But he enjoyed, for the first time in his life, lying on the beach in bathing trunks. He was no longer self-conscious of his body, and even had a desire to be completely undressed. On his way home he travelled part of the way by train and felt no discomfort.

At the last group meeting he attended he also asserted that he was no longer tormented by his fantasies, but this statement was only partially correct, as the therapist learned in subsequent individual interviews. He continued to have sexual fantasies which were mostly of a masochistic nature; they neither caused him intense guilt feelings, nor did they prevent him from associating freely with young girls.

Comments on Psychopathology.

In the psychosexual constitution of this patient sado-masochistic and anal-erotic drives were conspicuous, and some of them had remained relatively undistorted through repressive mechanisms or reaction formations.

His sadistic leanings were accentuated through identification with the sadistic personality of his father. They also served as a means of disguised satisfaction for erotic impulses, which were prevented from unrestricted conscious representation. Through empathy with the objects of his beating fantasies (who in his thoughts enjoyed the beating) he was enabled to gain a vicarious gratification of his masochistic and passive homo-erotic trends.

The sadistic-erotic desires were directed towards adolescent girls. The choice of these objects was overdetermined and revealed his fundamental bisexuality. In the first place they represented his younger sisters, whose castigation by the father had been welcomed by his jealousy; but they also had been objects of libidinal attraction with whom he had wished to indulge in sexual play, e.g. to apply suppositories or to pass water in front of them. There were also some indications that incestuous mother desires had been personified in these sadistic-erotic imaginations. On the other hand, the immature bodies of adolescent girls also tempted him through their boyish qualities. It was, however, noticeable that this homo-erotic aspect was relatively free from sadistic desires. He became aware of a friendly feeling of "fatherly" attraction to young boys without any desire to beat them. His homosexual leanings were, on the whole, passive and masochistic; they were strongly repressed, and he became only vaguely conscious of them in the course of treatment.

It seems that sadistic fantasies had to some extent served as a defence against the emergence of passive and masochistic impulses. These latter impulses gradually increased in strength as the treatment progressed, and eventually exceeded his sadistic inclinations. Passive-erotic trends were clearly linked with fantasies of female identification, and their anal-erotic

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roots could be discerned in the desire for the rectal insertion of an object during intercourse or masturbation.

Of other libidinal impulses, the desire for sexual perception and the related urge to expose himself sexually had largely contributed to his motivational conflicts and anxieties. He recalled memories which pointed to his infantile wish for sexual seeing; his sadistic fantasies included an initial undressing ceremonial to lay bare the sexual region. He had also minutely inspected his wife's genital region on several occasions. He had been severely punished once for exhibiting his penis to a younger sister, and in his later life anxiety dreams of appearing naked in the street were fairly frequent. In the group, he had great difficulty to overcome his fear of discussing sexual topics.

The repressive atmosphere of his early family life must be regarded as chiefly responsible for his failure to reach a mature genital level of psychosexual development. Fear of punishment and moral censure facilitated the regression to anal eroticism which predominated his adult personality. This regression was also conditioned by a hereditary predisposition from his father and by accidental experiences of anal pleasure in his childhood.

His superego development had resulted, through the influence of his disciplinarian father and his own sado-masochistic leanings, in an obsessionally strict character. His rigid moral code condemned the pregenital sexual impulses, of which he was aware, as evil and wicked. This self-condemnation was chiefly successful in isolating these impulses within the sphere of fantasy. The superego conflicts did, however, not remain entirely endopsychic; they were partially projected, so that situations which symbolized the threat of moral reprobation acquired a phobic quality. Significant changes of superego structure occurred in the course of treatment. The memory image of his father was transformed from a punishing and beating figure into that of a strict but benevolent person. Identification with this father image contributed to the weakening of sadistic fantasies and revealed itself in the paternal attitude of helpfulness which the patient adopted during the later stages of his group treatment.

The psychopathological structure of his symptoms, as far as it was revealed during treatment, reflected his conflicts over conscious and unconscious libidinal tensions in varying complexity. It appears that his avoidance of a church atmosphere and the associated fear of cinemas were mainly due to projections of religious superego threats. These symptoms were the first to disappear during group treatment.

His social fears appear to have been more complex in structure. Guilt feelings were only partially responsible for them. Much of his social anxiety was apparently aroused through the unconscious stimulation of repressed sexual desires, and particularly of passive, homosexual, and masochistic tendencies, in situations which necessitated close contact with strangers. When his occupation forced him to interview people in their homes he always refused an easy chair, but selected one which enabled him to sit upright and, if possible, to look down on the other person. His sadistic thought play had started in adolescence as a means to counteract passive fears in the face of authority. It also appears significant that these social anxieties increased in intensity

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and range when, after his marriage, he had to abandon the company of his former male friends. Under treatment, these social symptoms disappeared only after he had become aware of some of his homo-erotic leanings and had accepted the passive-feminine-masochistic trends of his disposition. His sadistic fantasies then changed into overt masochistic desires. The symptom of stage fright which he had experienced in his youth indicates that a fear of exhibitionistic temptations also played a role in the complex etiology of his social anxieties.

His travel phobia seems to have contained elements of superego and social fears, but its etiological structure was not fully revealed during treatment. Certain aspects of this symptom remained resistant to group treatment.

Discussion.

Analytical group treatment achieved a partial success in this patient. The manifest results obtained were principally limited to alterations of two aspects of his neurosis—relief of social fears and acceptance of passive-masochistic trends.

These changes are intrinsically connected, and must be regarded as manifestations of a re-orientation of the personality through treatment.

It is proposed to discuss these results with reference to the therapeutic group factors involved and the general limitations of group treatment.

The correction of difficulties of social adjustment and of neurotic handicaps in interpersonal relationships is generally considered one of the chief assets of group treatment. Neuroses precipitated by a change in social environment, e.g. after recruitment into the armed forces or on resettlement in civilian life, have proved themselves especially amenable to group treatment. Beneficial results have also been obtained in patients in whom chronic social anxieties have existed without obvious environmental precipitation. Schilder (1939) remarked: "As one would suppose, group psychotherapy is especially effective in cases of what I should characterize as social neuroses. These are cases that do not feel comfortable in the presence of others. . . . The individual feels that he is the centre of attention, that not only is something wrong with him, but that others realize it. Every object becomes, in this respect, an important object on a sado-masochistic level. To be seen and to be observed means to be hurt and to be pushed into an inferior positior." Of 12 cases of social neurosis he claimed 3 cured, 7 improved, and 2 unimproved. He also stated that many of his patients, and especially those with social neurosis, could not have been treated individually, even with the classical analysis. They reacted only in the group.

The therapeutic group factors operative in achieving these results are obviously complex and interrelated. Various aspects of them may be discerned in relation to the social fear syndrome of the present patient.

His fears contained an element of guilt which was consciously associated with his sadistic-erotic fantasies and other "guilty acts." An alleviation of such neurotic guilt feelings has been observed by all group therapists, and has been referred to such group factors as lessening of the fear of being different and abnormal, realization of the tolerant and sympathetic understanding of

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the group members, strengthening of self-esteem through emotional support and acceptance, acquisition of an objective attitude to personal conflicts through theoretical discussions, and other similarly reassuring influences.

These group factors were also noticeable during the treatment of this patient. The relief of guilt feelings through such reassurance and emotional support had, however, only a partial and temporary effect on his social anxieties. Their main value seems to have existed in engendering an attitude of positive transference which prepared the ground for further therapeutic influences.

Among the repressed drives responsible for his social fears it was noticed that desires for sexual perception, exhibitionistic impulses, and masochistic, passive-homosexual tendencies played a leading role. What group factors were active in reducing the anxiety caused by the unconscious stimulation of these drives?

Alexander (1946) stated that the basic therapeutic principle in all forms of analytical psychotherapy was an emotional readjustment which took place when the patient was re-exposed, under more favourable conditions, to conflict situations which he could not handle in the past. He termed this emotional readjustment "corrective emotional experience," and asserted that the acquisition of analytical insight was secondary to it in therapeutic importance.

It appears that the group setting constituted a conflict situation with regard to some of the repressed drives in the etiology of social fears in this case. The group task of self-revelation was a stimulus to his exhibitionism, and every disclosure of his sexual life which he anxiously made to the group was a corrective experience which mitigated his unconscious conflict about sexual exposure. The cathartic value of his confessions was partially due to this. It seems significant in this respect that his resistance against public confessions in the group was much greater than had been the case in the more private atmosphere of individual interviews.

Similar considerations hold true of his desire for sexual perception which, in the group, presented itself as a desire to hear the story of other members and to be instructed about the physiology and psychology of sex.

He never displayed any sado-masochistic leanings in the group; he neither criticised or slandered other members, nor did his attitude invite attacks and ridicule by them. His passive sexual trends were, however, constantly stimulated, and his response to the group underwent subtle changes in the course of time which seemed to reflect a gradual correction of his fear that he might react openly to sexual overtures. At first he tried to avoid answering sexual questions, and showed great embarrassment on such occasions. Later he was able to follow the lead of others in discussing sexual topics of a personal nature. Towards the end of the treatment it frequently appeared as though his remarks were designed to prompt the group to probe his innuendoes of sexual self-disclosure.

All sexual discussions in this completely male group must also have been corrective experiences for the homo-erotic components of his libidinal constitution. It seems to have been more than a temporal coincidence that his sadistic fantasies and irrational social fears disappeared jointly after the 51st meeting, when homo-erotic and passive-feminine impulses were for once openly

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discussed in connection with the close friendship that had developed between two other members.

The presence of homosexual stimulations in a male group setting has received relatively little attention in the literature. Ackerman (1946) mentioned "veiled flirtations of the homosexual type" in his groups of war veterans. The present writer (1947) had noticed these tendencies in groups which contained mild schizophrenic members. Similar observations were made by Dalberg* in out-patient groups of female neurotics. In this respect it may also deserve mentioning that in Schilder's report (1939) on his group therapy results he claimed to have cured a schizophrenic in whom "fear of homosexuality and homosexual ideas of reference had been in the foreground."

The value of providing substitutive gratifications for repressed exhibitionistic and homo-erotic drives is obviously not a characteristic peculiar to therapy groups. One is reminded here of the partiality for smutty stories, and the often frankly affectionate behaviour which is prevalent in the meetings of certain chronic alcoholics with a similar psychosexual constitution as the present patient, but a more accommodating superego. Their alcoholic meetings seem to constitute a group setting which has coincident therapeutic value.

The corrective emotional group experiences described cannot be regarded as transference phenomena in the narrow sense. They do not entail falsification of a reality situation through the emergence of emotions which are not adequate to the actual environment. The therapy groups must be considered in this respect as a social reality which can evoke homo-erotic and exhibitionistic responses in its members. Group treatment is in this sense more realistic than individual therapy. This may partially explain the greater intensity of emotional response which is observed in groups.

Insight is apparently not a necessary attribute of the therapeutic group effect. In the present case only partial insight was achieved.

Group treatment is generally regarded as a complement to individual therapy and not as a substitute for it. It has its special field of application as it "may utilize a segment of the psychodynamic and therapeutic spectrum which is not quite so readily engaged in individual treatment" (Klapman, 1946). From this it follows that its results have a different therapeutic range from those of individual psychotherapy. The limitations observed in the present case may, therefore, be an example of a general characteristic of all group treatment.

As has been pointed out, the social reality of a group setting favours certain emotional reactions, namely, those which are inherent in the situation and can, consequently, be repeatedly aroused and shared by other members. Individual transference reactions which have no echo in the general emotional atmosphere of the group are necessarily too evanescent to lead to corrective emotional experiences or to allow repeated analytical interpretations. Unconscious levels are, therefore, accessible through group treatment in a limited degree only. This fact has also been stressed by Foulkes and Lewis (1944), Slavson (1947), and Ackerman (1946).

* Personal communication.

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The tentative conclusion may be drawn that the nature of corrective emotional experiences and consequently the range of therapeutic effectiveness is determined, apart from individual factors, firstly by the group setting as such, and secondly by the special circumstances of the group composition. Research with different groups, and particularly with groups of mixed sexes, or groups guided by both a male and female therapist, seems to be indicated to evaluate the therapeutic value of more extensive and varied corrective emotional experiences aroused by groups.

It might be contended that a longer course of group treatment might have produced further results. The patient, however, felt that he had gained the maximum benefit and it was his decision to terminate the group treatment. When individual treatment was offered to him some months later he was eager to accept it, although he knew that he could have re-joined the group at any time. The author is inclined to agree with the patient's own judgment that further attendance would not have added anything essential to the results already achieved.

SUMMARY.

The effects of analytical group treatment in a phobic patient are described.

The psychosexual constitution of the patient and his response to the group were unusually transparent. He showed marked anal-erotic, sado-masochistic, and bi-sexual trends with repressed passive homo-erotic impulses.

The result of group treatment was mainly limited to a correction of irrational social fears through the reduction of guilt feelings and the gradual acceptance of his passive-feminine and masochistic leanings.

The therapeutic factors responsible for these results are discussed. The group is regarded as a social reality which can relieve guilt feelings through reassuring influences. More fundamental personality changes are produced through corrective emotional experiences. These are not transference phenomena in the narrow sense as they are adequate to the actual environment. The stimulation of exhibitionistic and homo-erotic drives in a completely male group is emphasized, and the therapeutic value of this stimulation is discussed with reference to the particular psychosexual constitution shown by the patient.

The therapeutic range of group psychotherapy seems to be determined, apart from individual factors, by the group setting as such, and the special circumstances of group composition. Research with groups of different compositions is suggested to widen the range of possible corrective emotional responses.

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PUPILLARY ABNORMALITIES IN SCHIZOPHRENIA AND DURING MUSCULAR EFFORT.

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THE pupils of a normal subject are generally described as equal, reacting by constriction or dilatation to various stimuli. Inequality of the pupils as an isolated finding is said to be relatively common, but impairment of the light reflex, especially in conjunction with pupillary inequality, is held to be strongly indicative, if not pathognomonic, of organic disease of the nervous system. An exception is the " tonic pupil," for whose abnormally protracted reactions to light and accommodation an organic lesion has not yet been demonstrated. However, impairment of the light reflex is known to occur in subjects in whom there is no evidence of organic nervous disorder. These abnormalities of the light reflex have attracted little attention in this country, and are ignored almost entirely in text-books of neurology and psychiatry. Redlich (1908) made the important observation that muscular exertion might lead to dilatation of the pupil with impairment of the light reflex. Levine and Schilder (1942), in an extensive investigation of this phenomenon, concluded that muscular effort would produce dilatation and impairment of the light reflex in any pupil which initially retained its response to light, and would accentuate a pre-existing abnormality or bring out a latent tendency to impairment of the light reflex. Westphal (1907) first described the pupillary abnormality in catatonic schizophrenia to which the term " catatonic pupil " has been applied. This abnormality consists of pupillary dilatation with impairment of the light reflex, and is usually bilateral. The reactivity to light may vary from moment to moment, or from day to day ; or pupillary rigidity may persist for a considerable time, with transient periods of brisk reactivity. Estimates of the frequency of the " catatonic pupil " vary remarkably—from 54 per cent. (Schilder and Parker, 1931) to 3·4 per cent. (Reichmann, 1913). Apparently a higher incidence has been found where repeated examinations have been carried out on the same subjects, but proper comparison is impossible, as the technique of examination has not been detailed by any of the authors.

PRESENT INVESTIGATION.

343 male schizophrenics and 100 mentally normal males, all under the age of 55, were examined for pupillary inequality, after which a constant technique of examination was used to study the pupillary reactions to pain, light and muscular effort.

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Technique of Examination.

Examination for pupillary inequality.—This was carried out in subdued light, at the shaded end of a room, with no direct light near the subject, and no "glare" from windows, walls or objects within the room. In practice this amounts to the minimum light intensity in which the pupil of a brown-eyed subject can be studied satisfactorily. Inequality was recorded as being present only if clear-cut.

The light reflex.—This was tested in subdued light, and in the dark when necessary, by suddenly switching on a 2·5 volt pocket flash-light held approximately 1·5 cm. in front of, and 1·5 cm. lateral to, the centre of the pupil, this being just medial to the outer canthus. With the flashlight in this position, and the subject looking straight ahead at a distant object, the effect of accommodation-convergence is eliminated, and any failure in co-operation can be detected easily. If co-operation was inadequate, the light was switched on with the beam directed away from the eye, and then suddenly directed at the pupil. The reaction of each pupil was tested at least three times on each occasion. Subjects were tested twice on separate days for inequality, and impairment of the light reflex; where abnormalities were found, the tests were repeated frequently during the following month.

The response to pain.—This was tested once in subdued light. A piece of surgical lint was placed over the side of the neck (this prevents the fingers from slipping) and a small fold of skin about two inches vertically below the mastoid process was pinched up through the material between the thumb and first two fingers; a firm, steady pinch was maintained for about two seconds, first on one side, and then on the other. If no dilatation at all was observed on testing and re-testing the result was recorded as negative, but the slightest dilatation was recorded as positive. Non-co-operative subjects were excluded.

The response to muscular effort and its effect on the light reflex.—These were studied once, in two stages, in subdued light.

(1) Mild exertion: The subject squeezes two fingers of an assistant as hard as possible with his right hand.

(2) Moderate exertion: The subject flexes his arm against strong resistance by an assistant.

Non-co-operative subjects were excluded.

Table I.—*Composition of Test Group.*

Schizophrenia (all types)		343
Simple	28	
Hebephrenic	82	
Catatonic	18	
Paranoid	98	
Paraphrenia	10	
Schizophrenic dementia	93	
Superimposed on congenital mental defect	14	

Cases of chronic schizophrenia characterized by apathy, a tendency to negativism, occasional hallucinosis and infrequent incoherent speech have been classified as schizophrenic dementia.

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FINDINGS.

The percentage figures in the tables are worked out to two figures.

TABLE II.—*Incidence of Pupillary Inequality.*

Diagnosis.	Inequality (total incidence).		Inequality + abnormal light reflex.		Variable inequality alone.		Variable inequality + abnormal light reflex.		Constant inequality (alone).	
	No.	%	No.	%	No.	%	No.	%	No.	%
Schizophrenia (343 subjects)	44	13	14	4·1	2	0·59	2	0·59	26	7·6
Controls (100 subjects)	20	20	1	1	—	—	—	—	19	19

Pupillary inequality is much more common in normal subjects than is generally recognized; the difference in incidence between the two groups is misleading, as approximately 30 per cent. of schizophrenic subjects did not co-operate fully. Only glaring abnormalities can be detected if the eyes are continually shifting around or partially concealed by frequent blinking, so it is highly probable that cases of mild inequality were not detected in non-co-operative subjects. The findings confirm the statement of Levine and Schilder (1942) that the "catatonic pupil" is characterized by variation in degree of inequality, as well as by variation in the reaction to light. Thus:

1. Although minor fluctuations in the degree of inequality were found in both groups, they were more common in schizophrenics.

2. Gross variation in the degree of pupillary inequality (i.e sometimes one pupil would be larger; sometimes the other) without abnormality of the light reflex was found in two schizophrenics.

3. Gross variations in pupillary inequality from day to day, with variable impairment of the light reflex, were found in two other schizophrenics.

Abnormalities of the Light Reflex.

It is generally recognized, although seldom taught, that in some subjects the response to successive flashes of light may vary, being poor one moment and good the next. This variation in response occurs more frequently in schizophrenics (10 per cent.) than in normal subjects (3 per cent.), and is often found in schizophrenics whose pupils show consistent impairment of the light reflex on other occasions. The impairment of the light reflex may be closely related to the "startle reaction." A sudden flash of light produces a definite "startle reaction," and it is frequently found that there is little contraction of the pupil in response to the first flash of light, but a brisk response to the second or third.

In resistive and unco-operative subjects considerable difficulty is encountered in judging the reaction to light, as the size of the pupil is continually changing, due to accommodation-convergence on different fixation points, and the effects of forceful deviation of the eyes. As many of these subjects roll the eyes up during examination, a study was made of the effects of strong upward gaze in 100 normal subjects.

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Effect of strong upward gaze on the pupil:

*No effect	73
Pupil dilates	5
Pupil contracts	8
Size of pupil unchanged, light reflex sluggish	3
Pupil contracts, light reflex sluggish	4
,, ,, ,, ,, absent	7

It is clear that in resistive and unco-operative subjects an abnormal response to light may be of no pathological significance. Abnormalities of the light reflex, other than those described above, are shown in Tables III, IV and V.

TABLE III.—*Distribution of Abnormalities of the Light Reflex.*

Diagnosis.	Abnormal (total incidence).		Abnormal + inequality.		Abnormal alone.	
	No.	%.	No.	%.	No.	%
Schizophrenia (343 subjects)	53	15	14	4·1	39	11
Controls (100 subjects)	1	1	1	1	—	—

TABLE IV.—*Incidence of Abnormality of the Light Reflex in Different Mental Disorders.*

Diagnosis.	Number of cases.	Number abnormal.	% abnormal.
Simple schizophrenia	28	4	14
Hebephrenic schizophrenia	82	14	17
Catatonic schizophrenia	18	2	17
Paranoid schizophrenia	98	9	9·2
Paraphrenia	10	2	20
Schizophrenic dementia	93	18	19
Schizophrenia superimposed on mental defect	14	4	24
Congenital mental defect	15	2	13
Controls	100	1	1

TABLE V.—*Analysis of Abnormalities of the Light Reflex.*

Type of abnormality.	Schizophrenia.		Controls.	
	No.	%.	No.	%.
Sluggish in subdued light only	44	13	1	1
Sluggish in subdued light and in the dark	1	0·29	—	—
Absent in subdued light, sluggish in the dark	5	1·5	—	—
Absent in subdued light and in the dark	3	0·87	—	—

* In many of these subjects the pupil constricted slightly at first, and then returned to its original size.

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In drawing up the above tables the abnormality recorded for each case is the greatest abnormality observed in that subject. In only two cases was the abnormality constant during the period of observation.

The following abbreviations are used in case-histories :

L., left pupil ; R., right pupil ; >, greater than ; =, pupils equal ; fix., light reflex absent ; sl., light reflex sluggish.

The results of examinations on different days are separated by a colon, e.g. result of first examination : of the 2nd : of the 3rd : etc.

Patient W. D—, aged 52, paranoid schizophrenic. Abnormality probably a minor variant of the tonic pupil. Reaction sluggish in subdued light ; adequate, but slower than normal, in the dark. Accommodation-convergence slow (about 5 seconds), and sustained. Tendon reflexes brisk.

Patient H. S—, aged 48, schizophrenic dementia. Fix. L. >fix. R. in light and dark. Accommodation-convergence fair. Tendon reflexes brisk.

In the other subjects the degree of abnormality varied from day to day, and was often asymmetrical.

Patient N. D—, aged 45, hebephrenic. Variable inequality and variable light reflex. R. sl. >L. : L. >R. sl. : R. sl. = L. sl. : L. >R. : R. sl. >L. sl. : L. >R. : R. sl. >L. sl. : L. >R. : R. >L. : R. >L. : R. = L.

In one patient variation during even shorter periods was observed.

Patient S. L—, aged 36, schizophrenia superimposed on congenital mental defect. 9.20 a.m., sl. L. >R. ; 9.22 a.m., sl. L. >R. ; 9.26 a.m., L. >R. ; 9.30 a.m., L. >R. ; 9.34 a.m., fix. L. >R. sl. ; 9.45 a.m., L. = R. ; 9.47 a.m., L. = R.

Syphilis could be excluded as a cause of the abnormalities in all except two cases ; it is improbable that neuro-syphilis existed in either of these.

TABLE VI.—*Pupillary Response to Pain.*

Diagnosis.	Number co-operating.	Positive %	Negative. %
Schizophrenia	211	66	34
Controls	100	83	17

These figures show diminished sensitivity of the pain reflex in schizophrenics.

Pupillary Reactions to Muscular Effort.

Results are recorded as follows :

— No change.
+ Dilatation.
++ Dilatation + sluggish light reflex.
+++ Dilatation + absent light reflex.

TABLE VII.—*Response to Mild Effort.*

Diagnosis.	Number co-operating.	—%.	+%.	++%.	+++%.
Schizophrenia	212	61	36	2·1	0·52
Controls	100	26	73	1	—

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TABLE VIII.—*Response to Moderate Effort.*

Diagnosis.	Number co-operating.	−%.	+%.	++%.	+++%.
Schizophrenia	220	37	45	12	5·5
Controls	100	14	59	27	—

In the schizophrenic group a greater proportion showed no response to muscular effort. In a certain proportion the light reflex was lost altogether, this presumably being due to the bringing out of a latent abnormality. The results in normal subjects are consistent with previous observations that the dilatation and impairment of the light reflex are proportional to the degree of muscular effort (Schilder and Parker, 1931; Levine and Schilder, 1942), but only if the subject is completely relaxed before the test, and the command to carry out the muscular effort is given suddenly. If the subject is told, "I want you to squeeze hard when I count three. Quite relaxed please—one, two, three," the pupil can be seen to dilate on the command "one," and in favourable subjects it dilates by numbers to a maximum on the command "three." In many cases the dilatation on the command "three" is small compared with the initial dilatation. The initial dilatation is accompanied by a subjective sensation of "getting set," but the actual muscular tension developed is small in proportion to the pupillary dilatation.

The Pupillary Changes during Electro-convulsive Therapy (E.C.T.) and Insulin Coma Therapy.

Further study showed that muscular effort is accompanied by dilatation of the pupil and impairment of the light reflex, whatever the state of consciousness. Thus during insulin coma, dilatation of the pupil with diminution of the light reflex occurs always in association with some sort of motor activity, whatever the degree of consciousness—in sopor in association with motor restlessness and resistiveness, in coma with flexor and extensor spasms. This association is particularly noticeable during termination of a coma with intravenous dextrose, the onset of the pupillary changes coinciding with the sudden violent outburst of straining and restlessness that often occurs as consciousness returns. Similar changes occur during motor restlessness in the stage of nitrogen inhalation therapy before loss of consciousness (Levine and Schilder, 1942), and in the motor excitement that occasionally follows E.C.T. Dilatation of the pupil with loss of the light reflex also occurs during the tonic phase of the fit produced during E.C.T.; the pupil remains in this condition during the clonic phase, and returns to normal 5 to 60 seconds after the fit ceases. (In one case the light reflex returned towards the end of the clonic phase.) A "sub-convulsive" dose produces a short muscular spasm with dilatation of the pupil and impairment of the light reflex for a few seconds. The pupil then returns to normal. If a delayed fit occurs, the pupil may return to normal and then suddenly dilate and become fixed to light as the tonic phase comes on. These pupillary changes probably occur during all major epileptic fits, as they were also noted during a fit which occurred spontaneously in a patient

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in insulin coma whilst I was actually studying his pupils. The resemblance to the " Redlich phenomenon " is striking—during a fit great muscular tension is accompanied by dilatation of the pupil with loss of the light reflex. The main difference between this and the changes during normal muscular effort lies in the state of consciousness of the subject, and in the degree of muscular tension developed. The pupillary changes during E.C.T. may be considered to be those of severe muscular effort in an unconscious subject.

Discussion.

The Etiology of the Pupillary Changes during Muscular Effort.

Previous discussion on this subject has been concerned with the question as to whether the changes are due to " psychic " causes, or to some special effect of the muscular tension itself. The most recent contribution is that of Levine and Schilder (1942). They concluded that muscular effort produces its effect by inhibition of the pupillo-constrictor centre, and that this inhibition is reflex, due to stimulation of the splanchnic nerves by the rise in intra-abdominal pressure accompanying the muscular effort.

Discussion as to the relative importance of psychic factors and muscular tension has the unfortunate effect of obscuring the two fundamental issues :

1. Are the effects due to nerve impulses directly from higher levels, or are they reflex, due to the muscular tension itself? (The effects occur without any latent period, and so cannot be due to adrenaline or metabolites released into the bloodstream.)

2. If the former alternative is correct, are the impulses from higher levels of psychic or of somatic origin, and what are the underlying physiological mechanisms?

There is considerable evidence that muscular tension *per se* is not responsible for the pupillary changes. It has been mentioned above that the pupillary changes during E.C.T. may be considered to be those of severe muscular effort in an unconscious subject. A study was made of the pupillary changes in patients undergoing E.C.T., modified by the intravenous administration of curare in dosage sufficient to abolish all muscular contraction, except for almost imperceptible movements in the diaphragm and facial muscles. In these patients the pupillary changes were exactly the same as those during unmodified E.C.T. (curare alone had no effect on pupillary size or reaction to light). In other words, motor impulses from " higher centres " can cause pupillary changes in the absence of muscular tension. Also, as stated above, in conscious subjects pupillary changes may precede the actual muscular effort. It is clear that the hypothesis that the pupillary effects are due to raised intra-abdominal pressure is inadequate. The facts indicate that the pupillary changes during muscular effort are due to motor impulses from higher levels.

These impulses may be either psychic or somatic, or both, e.g. psychic factors predominate in producing the pupillary changes—

(1) Whilst " getting set " for voluntary effort.

(2) During the muscular tension associated with emotional stress.

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Somatic factors predominate in producing the changes:

(1) During major epileptic fits.
(2) During flexor and extensor spasms in insulin coma.

Any suggestion as to the physiological mechanisms involved is purely speculative. It is usually stated that sympathetic stimulation causes dilatation of the pupil, without any effect on the light reflex. This is manifestly incorrect, as an active dilatation of the pupil must interfere with simultaneous contraction and so cause impairment of the light reflex. There is every reason to believe that the law of reciprocal innervation applies to the movements of the pupil, and that the pupillary effects are due to sympathetic stimulation in combination with simultaneous para-sympathetic inhibition. It is possible that simultaneous sympathetic stimulation and para-sympathetic inhibition are brought about as part of a generalized discharge from the hypothalamic autonomic centres. Thus a rise in blood-pressure, tachycardia, and pupillary dilatation occur during E.C.T. modified by curare, where the changes cannot be due to muscular tension. This autonomic discharge may be initiated by impulses from both cortical and infra-cortical levels, as pupillary changes accompany muscular spasms during the stages of insulin coma where cortical function is abolished (e.g. during flexor and extensor spasms).

Pupillary Abnormalities in Schizophrenia.

In schizophrenia there is a high incidence of diminished pupillary response to pain, light and muscular effort. Hyporeactivity to various other stimuli has been demonstrated in schizophrenics—to thyroid extract, insulin, dinitrophenol, vestibular stimulation and inhalation of hot moist oxygen (Mayer-Gross and Moore, 1944). From the psychobiological standpoint these findings may be correlated with the schizophrenic's lack of normal emotional response to the outside world. It is interesting to note that the term "withdrawal" has been applied to the psychological and physiological changes in schizophrenia (Mayer-Gross and Moore, 1944).

The abnormalities of the light reflex are of particular importance, as they may lead to confusion in the differential diagnosis of schizophrenia from neurosyphilis, and also in the diagnosis of neurological disorders appearing incidentally in known schizophrenics. The term "catatonic pupil," although appropriate, is misleading, as abnormalities occur in mental disorders other than catatonia. I have seen inconstant diminution of the light reflex in mental defectives, and in a subject suffering from simple depression, and it has also been described after epidemic encephalitis (Westphal, 1907), in psychoneurosis, alcoholic delirium, arteriosclerotic psychosis and neurosyphilis (Levine and Schilder, 1942). Moreover, abnormalities are just as common in other types of schizophrenia as in catatonia.

The cause of the pupillary changes is as uncertain as the cause of schizophrenia itself. Schilder and Parker (1931) advance a theory of multiple causation, postulating constitutional, toxic-organic, and psychic factors. There is no doubt that somatic factors, whether constitutional or acquired, play a

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part in the production of the pupillary abnormalities, but not everyone will agree with Schilder and Parker in their emphasis of somatic constitutional factors. There is considerable evidence that emotional changes are important in the production of the pupillary abnormalities. In cases quoted by other authors, the relationship of the abnormality to emotional factors is clear-cut; for example, in Westphal's (1907) case of traumatic neurosis, which developed changes whenever the question of withdrawing compensation was raised, and in Levine and Schilder's (1942) patients immediately before nitrogen inhalation and metrazol convulsion therapy. The high incidence of abnormalities in schizophrenics may be correlated with their apprehension, suspicion and timidity, and with the severity of their emotional disturbance. In the present series a considerable proportion of the patients, whose pupils reacted poorly to light, showed gross manifestations of emotional disturbance during examination, and it has been pointed out above that variable impairment of the light reflex may be related to the "startle reaction." Schilder and Parker (1931) attributed the disproportionately high incidence of abnormalities in negro schizophrenics to somatic constitutional factors. It is equally plausible that the high incidence is attributable to emotional factors, as superstition, apprehension and resistiveness appear more commonly in the negro.

It may appear contradictory to stress emotional factors as the cause of the pupillary changes, and at the same time to correlate diminished reactivity to light with "withdrawal." However, "withdrawal" does not necessarily mean apathy—the world of unreality may be actively defended against outside interference. Interfering stimuli may be dealt with by ignoring them, but if a situation such as physical examination interferes with the world of unreality, it creates an emotional disturbance, and is resented and resisted. Thus the apprehension, suspicion, and resistiveness of the schizophrenic are directly related to withdrawal from reality.

There is a close connection between the Redlich phenomenon and the pupillary changes in mental disorders, inasmuch as psychic factors play a prominent part in both, and mental disorders are frequently accompanied by changes in muscular tension. It is possible that the same nervous pathways are involved in both cases. The following case is an excellent demonstration of the close relationship between emotion, muscular tension and pupillary abnormalities.

Patient K. G—, aged 26, paranoid schizophrenic. Actively hallucinated, aggressive, persecuted and pre-occupied with somatopsychic delusions. Routine examination—pupils normal, react well, dilate with muscular effort. He was taken out of the hospital by his relatives, and subsequently had to be brought back; when seen immediately after his return he was quiet—pupils normal. During conversation he developed hysterical tremors of the arms and legs, his comment being, "I need treatment—I've got to get out of here." These tremors could be brought on or terminated by suggestion, so that repeated study could be made of the pupillary changes during "attacks," the changes appearing to be proportional to the extent of the hysterical manifestations. With mild tremors of both arms there was no change in the pupils; with moderate tremors of arms and legs there was slight impairment of the reaction to light; and when severe movements were continually shaking the entire body there was marked impairment of the light reaction. The next day the pupillary reactions were normal.

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SUMMARY.

Abnormalities of the pupillary light reflex occur in schizophrenia, and are closely related to the pupillary changes during muscular effort, which are attributed to simultaneous sympathetic stimulation and para-sympathetic inhibition by motor impulses originating in the hypothalamus. Psychic factors are important in the production of the pupillary changes in mental disorders and during muscular effort, but these changes are not exclusively of psychic origin.

From a psychobiological point of view the abnormalities of the pupillary response to light, pain and muscular effort in schizophrenics can be correlated with their hyporeactivity to various other stimuli, and with their lack of normal physical and emotional response to the outside world.

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MODERN TRENDS IN THE PLANNING OF MENTAL HOSPITALS AND OTHER PSYCHIATRIC UNITS IN ENGLAND.*

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THE mental hospital of to-day has developed in stages from the earliest of which we have any particulars.

Progress in planning and design has been gradual, with periods during which it has been pronounced. Each period has shown an advance in the lay-out and detailed arrangement of the buildings to meet the coincident advance in methods of care and treatment of the patients.

The very early buildings had no definite plan, were more like prisons than hospitals, and provided indifferent accommodation, comprising mainly cells, opening off passages of communication which yet provided practically the only day space. Patients were chained and locked in these cells by day and night and had little medical attention.

As more humane methods of treatment were adopted, the need for better accommodation was realized, more space was provided for day use, passages were wider and became day corridors or galleries, some with bay windows projecting at intervals, some with projecting day-rooms at the ends; dormitories—each for a few beds—were introduced; single rooms were improved and a general plan evolved, sometimes designated "the corridor plan," comprising the central block of administrative buildings, with patients' wards extending on each side—for male and female patients respectively—at right angles to the axis of the central block, or returned to form an open quadrangle, in some cases enclosed by other wards or by cross corridors at the back. Access to the outer wards from the centre was through the inner wards, and few of them were self-contained. A typical example of the later development of this type is Hereford Mental Hospital. As classification was introduced or improved, wards were allocated for various distinct groups of patients, first probably for the sick, then the infirm, the epileptics, the chronic workers and so on. Separation of the wards for these distinct classifications, planned as pavilions connected at ground floor level by a main corridor, became more general and produced the "corridor pavilion" plan. The arrangement varied with the plan of the corridors. In some cases these were on the lines of the capital letter **H**, with the administrative buildings on the cross bar of the **H** and the pavilions on the outer side as at Banstead, but, in later hospitals, the corridors spread diagonally from near the front of the administrative buildings,

* Read at the Annual Meeting of the Royal Medico-Psychological Association at Eastbourne on July 9, 1947.

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with the pavilions on the southern or outer side. This plan, with variations, applied generally until 1914. A notable feature introduced during this period was the provision of a detached acute hospital—the forerunner of the present Admission Hospital and Early Treatment Centre—and of the detached villas for certain classifications. These detached villas were few in number at first, but increased in later examples. A typical example of this period is Long Grove, in which the corridors and covered ways form a broad U in plan. The wards are planned in echelon connected at the corners each having an access from the U. The detached units—hospital, convalescent, chronic and working patients' villas and the isolation hospital are suitably sited in relation to the main buildings.

The latest example of the type is West Park, also on the Horton estate, similarly planned, but with the wards unconnected, each having its access from the covered way and not from the adjoining ward. The wards, however, overlap, which spoils the aspect from some of the rooms of each ward and limits the area of the exercise gardens. The detached units again are suitably planned.

Many other hospitals deserve mention as illustrating the growing trends, but these cannot be dealt with in the limits of this paper. Mention, however, must be made of the Ewell Epileptic Colony, opened in 1904, which was planned on colony lines—a logical development of the detached units—continued in later extensions. This institution is now known as St. Ebba's Hospital, and is the first mental hospital in this country to be planned entirely on colony lines.

Modern trends in planning of English mental hospitals may be traced from the inter-war period of 1919-39, in which the Board's suggestions were revised, further developments were encouraged, and, in particular, the provision of Early Treatment Centres comprising an Admission Hospital and Convalescent Homes—with provision for future semi-convalescent Homes and Nerve Units;—of conjoint units for the sick, the senile and infirm, the noisy and disturbed —designated the closed units—and the adoption of the colony plan of detached units for all patients were recommended. This period also saw the development of Nursing Homes, of institutions for voluntary cases, of Out-patients' Clinics—though, in most cases, existing buildings were used or adapted for these purposes—and provision of many Mental Deficiency Colonies.

Of the new mental hospitals, Shenley Hospital for Middlesex shows a step in the current development. The administrative buildings are central as usual. Immediately opposite on the South is the Admission Hospital and two Convalescent Homes, not so distinctly separated as desirable. On each side of the official unit are the wards for sick and infirm and for quiet and harmless patients and, near the back of the administrative buildings, are units for the disturbed and excited for each sex. The remaining units are all on detached sites, on ring roadways giving ample space for separate gardens to each unit. Shenley Colony for mental defectives lies nearly a mile to the North of the mental hospital, and is planned, as all other mental deficiency colonies, with all units detached. The general lay-out follows the accepted plan, with its central group of administrative buildings and workshops—the latter of which are

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much more extensive than at a mental hospital—and the arrangement of the patients' homes, well apart, around large open spaces and with homes for the lowest grade cot and chair cases sited away from the other homes.

The next hospital to be erected was Runwell Mental Hospital.

The lay-out is symmetrical. The administrative buildings are central, with the sick hospital for both sexes—completely detached—situated directly opposite on the South. On each side of the official block are units for epileptics, unemployables and the infirm; behind are wards for non-parole working patients, conveniently near the workshops at the rear. All these are enclosed within a roadway. To the North on each side are two parole wards with provision for a third, around open quadrangles as exercise gardens.

The Early Treatment Group is off the drive to the East, practically in its own grounds, where the patients and their visitors are away from the main buildings and out of contact with chronic patients.

The conjoint closed unit is in a corresponding position on the West, well detached from the main buildings. It includes a new feature—a special treatment centre and also occupational therapy rooms.

Barrow Gurney Hospital, near Bristol, departs very definitely from the orthodox; no attempt has been made to provide a symmetrical arrangement, but a well-balanced scheme has been designed. The entrance is from the North, the drive separating East and West at the church—enclosing the group of detached central administrative units. From the South end the road forms a large oval, the male units being sited on the West curve, the female on the East, a private patients' unit separating the two sections, and the interior of the oval providing the main recreation ground. The Early Treatment Centre is to the East of the official block secluded by woods; the conjoint unit is opposite to the West, also in a wood, and the sick hospital is to the East of the oval, approached by a branch road and also by a road from the Early Treatment Centre.

So far a portion only of the buildings has been erected, some of the patients' units being used temporarily for staff. The final scheme is for 1,150.

Two schemes were ready for erection, but deferred on the outbreak of war. Of these, the third mental hospital for Essex at Margaretting has a very attractive lay-out and provides for 1,200 patients. The site lies to the South of the main London-Chelmsford Road and is intersected by the L.N.E.R. The southern and larger portion was selected for the hospital buildings and the northern portion for the staff residences, planned on a model village lines.

On the left of the entrance drive at the South, near the lodge, are the Nurses' Home, the Matron's bungalow and the Early Treatment Centre. Opposite, East of the drive, is the group of parole villas for female patients, and well back from the drive is the conjoint sick hospital, with a private patients' unit beyond. The church occupies a prominent central position. The official block and administrative buildings are North of a cross main road separating the special units from the remainder, and at the East end of this road, concealed by a well-grown wood, is the conjoint unit for the disturbed and excited patients. On each side of the administrative buildings are the units for chronic patients with, at the end of the female group, a small separate

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unit for disturbed and excited female patients unsuited for residence in a conjoint unit. At the N.E. corner, well detached, are the parole villas for male patients.

Lathom Park, the remaining hospital which is ready for erection, was the subject of an architectural competition, initiated by the Lancashire Mental Hospitals Board, for a new hospital of 1,000 beds and a new mental deficiency colony for 2,000 beds, on a very large site intersected by a cross road, dividing it into two areas, each of the appropriate size for one institution.

The scheme for the mental hospital is attractive. It is to a certain extent on symmetrical lines, with a vague resemblance to the orthodox pavilion plan of pre-1914—but with all units detached.

The official unit and administrative buildings are central. A ring road, oval in shape, is planned on each side, on the outer sides of which are units for senile and infirm, epileptic and parole patients, with the conjoint sick hospital centrally on the South. Inside the oval, on the South of a cross path, are the units for the undefined and working patients, near the workshops on the North of the path, and near the administrative centre for easy access of patients to the recreation hall, etc. The Early Treatment Centre is in the South-West corner of the estate, with a separate entrance drive from the public road on the West and an internal road from near the Sick Hospital. Diagonally opposite, to the North-West of the main group, is the conjoint unit for the disturbed and excited patients, screened by a wood. The staff houses are planned on model village lines around St. John's Church, an existing parish church.

One particularly notable innovation in detail is a cafeteria for use by patients who can be trusted to make proper use of this facility, situated under the central recreation hall and cinema.

Burscough Colony on the Northern portion of the estate is completely detached from the mental hospital, excepting that a central power plant is arranged at a suitable point on the cross road from which will radiate all the engineering services to both institutions.

The Colony is planned on typical lines, with its central group of administrative buildings; patients' homes planned on the South side of ring roads; the conjoint sick hospital and conjoint tuberculosis unit central to the North, and cot and chair homes grouped nearby, but at a sufficient distance. The Nurses' Home is near the lodge, the homes for senior officials are planned near the public road, and the other staff houses are included in the model village at St. John's Church.

A definite trend in the planning of these later schemes is that the architects worked in close co-operation with the Medical Adviser to the Committee. The advantages are obvious, and while this is not a new departure, it is fortunately being more frequently adopted. Where such collaboration is closest, there the best results are obtained. This was particularly evident at Margaretting, where Dr. Masefield was so closely concerned, and also at Lathom Park and Burscough, where Dr. Grant and Dr. Robertson respectively acted with the architects in the preparation of the final drawings for the two institutions.

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It is desirable that this co-operation should extend even to minor schemes of alterations and additions, the Medical Adviser enumerating the needs and the architect showing how these can best be incorporated. It is a mistake to entrust such works to the Engineer, or Clerk of Works, as with few exceptions, neither of these officials has the architectural training to enable him fully to appreciate the architectural possibilities and to tender the best advice, as would be done by a properly trained architect, or more so—an important point—by an architect with special experience in mental hospital planning and administration.

The requirements for a mental hospital and the standards now adopted are fully described in the revised "Suggestions and Instructions" pamphlet, issued by the Board of Control. New suggestions are already coming to light. The desire to integrate the treatment of mental with physical illnesses and the correlation of mental and general hospitals for all purposes, including teaching, will bring forward many new problems, and further revision of the pamphlet is inevitable.

The site of the mental hospital of the future may be less remote than in the past, mainly for the convenience of the staff, of consultants, of students, of patients' friends, and also of parole patients who may be permitted to visit nearby towns, accompanied or unaccompanied. On the other hand, with the facilities of modern transport, the advantages of an open site in the country may outweigh these considerations.

The latest standards as to spacing of beds in the various units increase the minimum floor areas, but bed spacing must be the deciding factor. When this is applied to existing hospitals, a considerable reduction in the recognized accommodation of each will be inevitable. Further, the lack of balance of day and night space which prevails in many hospitals, owing to the allocation of day-rooms as dormitories to reduce overcrowding by night, will have to be rectified. Modernization of existing hospitals will be one of the problems to be tackled, and will include an opening out of wards to obtain better light and ventilation, improvement of single rooms, better sanitary arrangements with more space for ablutions, and the re-allocation of the accommodation to provide smaller and self-contained wards, *each, preferably, not exceeding* 40 *to* 50 *beds*, with all the features now regarded as essential. All these improvements will tend to a further reduction of the present recorded figures.

Regarding the planning of individual units, the main trends in all hospitals described and now applicable to new proposals are simplicity in planning and finish; arrangement of day rooms and of dormitories, with their single rooms, for easy supervision from a central point by the duty nurse; dormitories not exceeding 20 ft. in width for two rows of beds; more room in ablution rooms with basins fixed separately; W.C.'s for night use suitably placed to avoid the use of commodes, and the possibility of patients straying beyond supervision, and the provision of rooms for occupational therapy and other forms of treatment.

In the admission hospital, and the sick hospital in particular, but also in the closed and other units, actual treatment rooms required may vary with the methods of treatment introduced. The doctor will influence the design by

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stipulating the actual forms of treatment for which provision is necessary, and the architect will plan accordingly.

Another question may be the size of the Nurses' Home, which will vary according to conditions, such as accessibility of the estate, employment of non-resident or of part-time staff and so on. The introduction of lifts in these Homes, if of three or more stories, is a likely trend.

At this point it may be useful to mention other units of the mental health service.

The Maudsley Hospital, Denmark Hill, is a notable example. This hospital, now an institution for the reception of voluntary patients only under the provisions of the Mental Treatment Act of 1930, was established in the early days of this century, and later extended during the inter-war period. Owing to the limited area of the ground, all the buildings are of more than one story, and, unfortunately, the gardens are overlooked from adjoining houses. Provision includes large out-patients' departments for adults and for children, with waiting hall, dispensary, canteen, rooms for registry, records, adult social workers and child social workers; many consulting and examination rooms, occupational therapy rooms, gymnasia, massage and other treatment rooms, library, laboratories, etc., and residential accommodation for adults and for children in separate units. The adults' accommodation is on three floors, with, on each floor, day-rooms and single bed wards, all the normal amenities and an emergency staircase at each end. In one of the new buildings the stairs are carried up to the roof, where a roof garden, protected all round by a high wall, is laid out on attractive lines.

The children's unit is on an inverted **Y** plan and is a combined out-patients' and residential unit. The out-patients' section, with accommodation as previously mentioned, occupies the tail of the **Y** on the North and the in-patients' accommodation is arranged to the South, with six- and seven-bed wards, several single bedrooms with verandahs, balconies, the usual amenities and a roof garden and playground. These buildings are all well planned on modern lines, but the general lay-out is congested, with insufficient garden space—a definite disadvantage.

The York Clinic at Guy's Hospital is the first clinic to be erected in this country as a Psychiatric or Psychological Clinic in connection with a great medical teaching centre. It provides for the treatment of patients suffering from nervous and mental illnesses—but excluding all such as require certification—and facilities for the training of medical students. It is within the hospital grounds with a separate entrance, is six stories in height, with a roof garden compensating in part for the lack of sufficient area of land for normal gardens.

The accommodation is for 43 patients of either sex, a resident sister, and a married male nurse.

The main entrance, internal staircase and bed lift are at one end of the ground floor, on which are the main administrative rooms—interview rooms, doctor's office, sisters' office, nurses' room, library, lounge, occupation room and a flat for the married male nurse. On the basement floor are the gymnasium, dining room with servery, laboratories, various store rooms and

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vitrifier room. On the upper floors are the patients' wards, with a central corridor having on one side three-bed wards and single-bed wards with a central duty bay, and, on the other side, rooms for a doctor, sister and occupation therapy, servery and usual amenities. An emergency stair provides for escape in case of fire from all floors and the roof garden. The accommodation is so arranged that patients of each sex may associate or may be segregated as necessary.

Other interesting new hospitals deserve description, such as Bethlem Royal on its new site at Monk's Orchard, Woodside Hospital at Cranley Gardens, the successor of St. Luke's Hospital, and others ; but time is limited, and a few remarks on the more speculative trends of the future may be more appropriate.

In these remarks I express my views on planning, and none of them may be taken as suggesting the probable trend in the policy of the Board of Control, of the Minister of Health, or of the Regional Boards.

The development of early treatment facilities for patients showing symptoms of mild attacks of mental illness, the carrying into effect of the provisions of the National Health Service, the increase in treatment of out-patients, the provision of additional or new units for these services, whether within or outside the curtilage of the mental hospital in conjunction with general hospitals, teaching hospitals and universities, will all affect the planning of future institutions. It is probable that psychiatric wards for such cases may be provided in general hospitals. Such wards will contain provision for each sex, and will be planned more or less in accordance with the principles set forth in the Board's pamphlet. The patients probably will be mostly non-certifiable, requiring a short period of treatment in bed, and in the convalescent stage ; hence there will be wards for small numbers of beds, with a number of single rooms, dining and day-rooms, duty rooms and other usual amenities, an occupational therapy room, possibly other treatment rooms, and consulting rooms and examination rooms for specialists. Surgical treatment, massage, etc., will be available in the appropriate department of the hospital.

The out-patients' department of a general hospital seldom has sufficient accommodation available for all the needs, and this suggests that a separate detached psychiatric unit may be necessary. A similar argument applies generally to the other new units now on the horizon. New buildings, specially designed, will probably be required. To illustrate the trends in this direction, I prepared several plans for such units for Dr. Blacker in illustration of the views propounded in his book on *Neurosis and the Mental Health Service*.

These plans are in two groups. One group, referred to as Out-patients' Clinics, shows provision for out-patients only. The other group, referred to as Psychiatric Units, shows provision in addition for in-patients.

Operating suites, X-ray and other departments, staff and domestic facilities, etc., are not included in these plans, on the assumption that these units would be part of general hospitals or other groups of buildings where these facilities would be available.

All these plans are based on a definite list of requirements. They are *not* TYPE *plans*. I dislike the idea of type plans, the issue of which lends to repetition and lack of initiative in design. In all cases the best procedure is to have

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prepared a definite list of requirements of the accommodation in the proposed unit, and for the architect, in collaboration with the medical adviser, to prepare the necessary plans.

Changes in matters of policy will affect the future and the actual planning trends, but policy matters are beyond the scope of this paper, and decision upon them will be awaited with much interest. Upon them will depend probably the future of mental hospitals, and whether they will provide for all the needs, including teaching facilities within one estate, or whether some separation will be considered necessary. There are two schools of thought on this question, which I leave with you.

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THE PLANNING OF MODERN PSYCHIATRIC UNITS.*

By J. J. O'Reilly, M.B., Ch.B., D.P.M.,
Medical Superintendent, Winson Green Hospital, Birmingham.

I WELCOME the opportunity of presenting this short paper to the meeting, particularly as I have just returned from the United States, where I have seen something of the modern trend of psychiatry in that country.

The memorandum on the future organization of the psychiatric services, published by this Association in 1944, defines a psychiatric unit as that part of a general hospital, whether in-patient or out-patient, which is set aside for the treatment of mental disorders, with or without legal formalities.

It will probably be accepted by all that there should be the closest possible relation between psychiatry and general medicine, and that therefore the psychiatric unit should be situated in close proximity to a large general hospital, and that it should combine both in-patient and out-patient facilities.

There are those who would carry this close relationship with general medicine to the point of making the psychiatric unit an integral part of the hospital, in the sense that it would consist of a number of wards dedicated to psychiatric service. This, I believe, can only have a cramping effect on the work of the unit, from the point of view of the patient as well as the psychiatrist, and my own feeling is that the unit should be a separate self-contained block, but sufficiently near to the general hospital to allow of free access by means of a covered way. This leaves ample room for expansion, but at the same time allows of free use of the hospital facilities by such patients as are capable of utilizing them. This is the set-up found in the Michigan University Neuro-psychiatric Hospital, which was opened in 1939 in association with the Michigan University Hospital.

Consideration of the concluding paragraph of the above definition leads naturally to a discussion as to the scope and facilities of a psychiatric unit.

It will, of course, receive on a voluntary basis all patients, whether neurotic or psychotic, whose behaviour is such that they can associate with others without undue embarrassment to either. I understand that in the present state of the law all such patients would require to sign a voluntary application form within the meaning of the 1930 Act. This at once marks the unit in the eyes of the public as a place somewhat different from the rest of the hospital with which it is associated, and consideration might well be given to the removal of this handicap.

However, if the unit is to cater adequately for the early manifestations of mental illness, and particularly if it is associated with a teaching hospital,

* Read at the Annual Meeting of the Royal Medico-Psychological Association, at Eastbourne, 9 July, 1947.

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it will have to accept patients who are not volitional, or who from time to time show disturbed behaviour. This will have some bearing on the structural design of the unit, and here may I pay tribute to Dr. Masefield's conception of the use of the temporary treatment clause, and express the hope that in the very near future the law will be so amended as to allow all *non-voluntary* patients to enter hospital in the first instance on a temporary treatment basis, without certification.

Should such a unit include child psychiatry within the ambit of its service? In certain of the University clinics which I visited in America one floor was devoted to the care of children suffering from behaviour disorders, and I am bound to say that it created a very unfavourable impression on my mind. Their destructive propensities had been expended to the fullest extent on the fabric and fittings, and the conditions here were in startling contrast to the rest of the clinic.

I think that the same criterion of selection should be applied here as in the case of adult patients.

Finally, there is the question of patients referred for observation or treatment by the courts. In connection with the projected establishment of an early treatment centre in Birmingham, I have given much thought as to how such patients should be dealt with, and I have to confess that I have not found the solution. In one very well known American clinic, not only did they have their own prison and court within the building, but in many of the wards police officers were to be seen sitting by the bedsides of patients remanded from the courts on a charge of suicide. This seems to be a most unfortunate practice, and one bound to have an extremely bad effect on other patients and the public in general. I do not believe that such patients should be catered for in the type of psychiatric unit envisaged in this paper.

With regard to the size of such a unit, the trend of opinion both here and in America is to the direction of quite small units, and I was interested to hear from the Director of the Bellevue Clinic that he regards 90 beds as the maximum.

Unfortunately this problem has to be viewed from other angles than the purely psychiatric, and economic features force us to consider a much larger unit than this.

In the past the average mental hospital psychiatrist in this country has found his efforts completely stultified by the large numbers of patients he has had to care for, and in many cases he has ended up with a feeling of frustration, and has either left the service or settled down to a routine of writing quite useless case-notes on large numbers of patients, vainly trying to convince himself that he is making some contribution to the study of psychiatry. This, however, is not a difficulty confined to medical personnel—it applies to nursing staff and others. I have throughout my 25 years in mental hospitals seen quite good nurses gradually deteriorate intellectually and emotionally, losing all interest in everything but the routine administration of the ward. This is a matter that I will refer to later under the head of staffing, but for the moment I suggest that the maximum figure for a psychiatric unit should be 200 beds. This is sufficiently large to give an economic lay-out, but small

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enough to allow each member of the staff to have a detailed knowledge of each patient, and to maintain intimate personal contact with him.

I am convinced that aside from any specific treatment that may be carried out, the most hopeful approach to the early schizophrenic is constant unremitting personal attention.

I have said elsewhere that it is at least arguable that the accumulation in hospital of large numbers of schizophrenics, who of necessity must be left very much to their own devices, is a factor in producing the chronic deteriorated patients, and in this connection I believe that if a patient is not responding to treatment, then if his behaviour at all permits, he is much better off at home.

I am sufficiently old-fashioned to believe that the best administrative set-up is to have a medical man as head of the hospital. A psychiatric unit of 200 beds is sufficiently large to warrant a whole-time medical director, but with this number of beds he should find no difficulty in devoting three-quarters of his time to clinical work.

It may be interesting to give here the figures for some of the American University Clinics.

BELLEVUE has 400 beds, with an annual in-patient turnover of 20,000, while its out-patient department handles some 30,000 patients per annum.

The PHIPPS CLINIC, BALTIMORE, has 92 beds, with an annual turnover of 200.

By contrast, the INSTITUTE OF LIVING, at HARTFORD, probably the most luxurious psychiatric set-up to be found anywhere—for staff as well as patients—has 400 beds, with an annual turnover of 1,396 cases.

The WESTERN STATE HOSPITAL AND CLINIC, at PITTSBURGH, which was opened in 1937, has 200 beds, and comprises 17 floors.

One might now consider in a broad way the question of structural lay-out and design. I was struck with the severely institutional lay-out of some American clinics, though this applied more particularly to the State hospitals. I believe it is a mistake to think too much in terms of bricks and mortar. There is a very real psychological value in the impression made on patients by the physical appearance of the building in which they are to be treated, and I would suggest that considerable thought be given to the lay-out of the entrance hall and waiting rooms particularly. The importance of this was brought home to me very forcibly in one hospital where the admission units and examination rooms were housed in the basement.

It is true that the personal approach to the patients is much more important than the physical surroundings in which that approach is made, but I am sure most of us have been depressed from time to time by the cramped and overcrowded places in which we have had to work.

I should like to see the psychiatric unit of the future planned with a spacious and imposing entrance hall, and opening off this the administrative offices, and a generous allocation of reception and waiting rooms for the interviewing of newly admitted patients and their relatives. The out-patient department of the unit would be situated in this vicinity, and I would suggest that here there should be a sufficient number of general rooms to allow patients to wait in small groups rather than in one large waiting hall. This, in addition to the

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general advantage of comparative privacy, facilitates the segregation of patients whose symptoms may be distressing to others. There should also be sufficient accommodation here for auxiliary staff, such as clerical and social service, and an important item is a central filing and record room. So often records, even of patients under treatment, are relegated to some out-of-the-way lumber room, where they accumulate dust and dirt and are never readily available. One of the things which impressed me most in American hospitals was the organization of the records department, and in this respect they are certainly well ahead of any hospital I have visited in this country.

Then, too, the Americans make considerable use of basement accommodation, and since these have to be provided to take the various service lines, it should not be difficult to build them in such a way as to provide well lighted accommodation for laboratory and allied services. I realize that the suggestion that these departments should be relegated to the basement will arouse a storm of protests from the interested parties, but I have seen in several hospitals basement lay-outs containing these services which could not be criticized in any way.

I need hardly say that the out-patient department should contain a sufficient number of rooms to allow each psychiatrist to have his own consulting room, and to permit of expansion. In this connection it should be borne in mind that other personnel, including psychologists and social workers, require facilities for private interview. Provision should also be made for the use of individual methods, such as narco-analysis, so that the consulting room need not be out of action while a patient is recovering from the procedure. This raises the question of the use of convulsive therapy on an out-patient basis, and I might refer briefly to the development in some hospitals of a unit for this purpose. It consists of a small treatment room opening off a waiting room, and having on either side of it a small dormitory of half a dozen beds or so. Each patient is treated individually on a trolley bed, and is then wheeled into the dormitory and transferred to bed. While this is being done a second trolley is in use for the next patient.

Whatever may be said about the necessity for this form of treatment, it is one which imposes considerable emotional stress on patients awaiting it if they are within sight or sound of the procedure, and the foregoing seemed to be an excellent solution of the problem.

There will, of course, be provision for lecture and demonstration rooms for nursing staff, and in the case of a teaching hospital, for medical students also. There should be a spacious medical library and at least one conference room, and also a rest room for the use of medical and other staff. This might be combined with a small canteen ; the latter provision is, I feel, of some importance, as this is often the place where various staffs meet in an atmosphere which is conducive to mutual education and the interchange of ideas.

So far as in-patient accommodation is concerned, the primary consideration should be quite small wards, of not more than 10–15 beds each. Since psychiatric patients are likely to make a longer stay in hospital than the average it might be worth considering a design I saw in one clinic, where each bed was divided from its neighbours by a partition about $3\frac{1}{2}$ ft. high. This

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provides a measure of privacy, and yet does not interfere with nursing observation. There should also be two or three private rooms attached to each ward for the use of patients who wish to pay for such accommodation or whose symptomatology demands it. Patients who for the most part can be nursed in the open wards may from time to time develop mild behaviour disturbance, which necessitates isolation.

There should also be at least two interviewing rooms off each ward for the use of medical and allied staff. These should be so designed that they can be used for visitors to patients who are able to be up and about. Probably a small amount of sitting-room accommodation will be required on some wards and might take the form of a sun porch.

In practically every hospital the outstanding deficiency is in storage space for linen and clothing and in soiled linen accommodation. I hope this point will receive more attention than it has done in the past—indeed there seems no reason why use should not be made of chutes leading to a central sorting room.

This brings us to consideration of access to and from wards in regard to food supplies and removal of waste. Much needless labour is imposed on nursing and domestic staffs because of bad lay-out in this respect. It might be no bad idea if every hospital architect spent a few weeks working in the wards and kitchens of the average hospital before putting his plans on paper.

In the type of hospital we are considering there seems no objection to the use of lifts, and this would ease the burden of internal transport considerably.

So long as it is necessary to apply the somewhat crude methods of physical treatment in use to-day it will be an advantage to have a central unit for this purpose, particularly for insulin therapy, so that both sexes may be treated in common, with resulting economy of time and staff. This should be sited so as to be readily accessible from wards on both sides of the building.

Since the stay of patients in a psychiatric hospital is measured in months rather than weeks, provision should be made for an Occupation Therapy Department, a central reading room and library, and a small combined recreation room. There should also be a small canteen for the use of patients.

Particularly in the case of units attached to teaching hospitals there will probably be a small number of patients continuously disturbed, even though not to the extent found in the average mental hospital. For such patients consideration might be given to the construction of a small section isolated by sound-proofing from the rest of the unit. This is a project which is to be incorporated in the new building programme of one of the Massachusetts State Hospitals.

Staffing.

The basic unit in staffing will be a team consisting of the psychiatrist, psychologist and psychiatric social worker. The proportion of these to the patient population will depend on the extent to which use is made of auxiliary staff, and having regard to the relative dearth of qualified specialists in these fields, the extensive use of auxiliaries has much to commend it. This is a distinctive feature of American psychiatry, where free use is made of graduate

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nurses who have been trained in the administration of various forms of physical treatment, and in psychological testing. Indeed, there is much to be said for the employment of receptionists, clerical workers and others with a background of psychiatric nursing.

The proportion of psychiatrists to patient population is a difficult matter to decide, as it will depend to a large extent on the clinical orientation of the unit. Our knowledge of the basic factors underlying mental illness is so meagre that we cannot afford to neglect any method of treatment which holds out any hope of success, and which is reasonably safe. I would therefore plead that the therapeutic plan should be conceived on the broadest possible basis.

Earlier in the paper I stated my belief in having a clinical psychiatrist as the head of the unit. The choice of this officer is probably the most difficult problem in staffing, since a person with preconceived ideas can stultify the work of every other member of the team, and produce a sense of frustration which will nullify the most perfect architectural lay-out.

It cannot be too strongly insisted that in the present state of our knowledge all view-points should be represented on the staff, and each member of it should feel free to develop his therapeutic ideas, within reason.

I am impelled here to touch on what I regard as the unhappy concept of neuro-psychiatry—as if there were some special connection between these two disciplines to the exclusion of medicine in general. It is perfectly true that a good psychiatrist must have a sound knowledge of neurology and vice versa; but anyone with a wide experience of the psycho-neuroses must realize the multifarious points at which psychiatry impinges on general medicine, and the imperative necessity for a competent psychiatrist to be, not merely a skilled neurologist, but first and foremost a good general physician. I am aware that this view will arouse considerable opposition, but I feel that this concept of neuro-psychiatry is one into which we have drifted, rather than developed by logical argument, and I think we should face up to the implications of it, and consider whether such a development is for the ultimate good of either discipline, and what is more important, whether it is to the benefit of the patient—or his detriment.

I referred just now to the dearth of competent psychiatrists. With the expansion of the psychiatric services this position will be aggravated, and it therefore behoves us to make the most economic use of such as are available. Two things which impressed me on my American visit were, the much greater use that is made of auxiliary staff and the generous provision of individual consulting rooms. Even in the State Hospitals each medical officer had his own interviewing room on the ward, quite distinct from what we call in this country a clinical room. Each of these rooms was provided with a dictaphone, so that time was not spent in writing out long case-notes and observations. The psychiatrist's observations were recorded on the dictaphone and then sent to a central office, where they were typed out and incorporated in the case folder. These latter were filed in a central record room, and were readily available when required.

I feel this paper would not be complete if I did not make some reference

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to the dangers inherent in the setting up of psychiatric units on the lines envisaged in the R.M.P.A. Memorandum.

Unless there is the freest possible interchange of staff between the clinic and the neighbouring mental hospital, and not only medical staff, but nursing and allied staff as well, there is great danger that the mental hospitals will be isolated from the main stream of psychiatry, and become over-loaded with long-term and chronic patients. This can only lead to deterioration in standards of care and treatment, and a tendency for the mental hospitals to be staffed by second-rate personnel. I got the impression that this situation had already developed in America, where in some areas there is a really distinct line of demarcation between the University Clinic and the State Hospital.

That this impression was not entirely groundless is shown by the following extract from an article in the most recent number of the American journal, *Mental Hygiene*, entitled "Mental Hospitals, 1946." Here is the relevant quotation:

> "Something else is going on that though highly desirable in itself is, I fear, more of a hazard than a help. I refer to the increasing trend towards the establishment of receiving hospitals, and psychopathic wards in general hospitals, in which prompt and intensive treatment is given. Already such treatment centres are attracting personnel away from State hospitals. We must be on our guard lest the State hospitals come to be considered nothing more than dumping grounds for hopeless cases, and become even more custodial and inferior than they are."

I feel that this is a problem which should be discussed very fully, and I hope will be discussed at this meeting, therefore, I do no more than raise it.

In conclusion may I, with that outstanding propagandist in psychiatry, Dr. C. Charles Burlingame, express the hope that the psychiatric unit of the future will be a place—

> In which the best minds of the profession will accept the challenge of psychiatry, and specialize in this branch of medicine.
>
> In which the patient as an individual rather than the disease will be treated.
>
> In which all forms of accepted therapy will find a forum.

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A METHOD FOR DETERMINING THE TYPICALITY OF PERSONALITY DESCRIPTIONS. (APPLIED TO ASSESSING THE NOTICED AFTER-EFFECTS OF PREFRONTAL LEUCOTOMY.)

By J. C. RAVEN, M.Sc.

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I. THE PROBLEM.

If we have a group of letters describing how discharged post-leucotomy patients are getting on, and what they are doing (1), it is useful to be able to determine how far the traits reported can be regarded as typical of post-leucotomy patients in general, peculiar to a particular clinical class, or unique to a single patient. Information of this kind clearly helps a doctor to predict what personality traits are likely to be noticed after the operation.

It can be seen that success in almost any comparative study of personality depends upon the way in which a problem of this kind can be dealt with. It can also be seen that if we are to distinguish clearly between the frequency with which a given trait is reported and the frequency with which it actually occurs, a person's *character*, in the sense of what he is in himself, should not be confused with his *personality*, in the sense of the impression he makes upon other people.*

The method of handling reported observations described in this article was originally used for the comparative study of psychological projection records (3). The principle is, however, quite general, and can be applied to the comparative study of almost any descriptive material which permits of being classified.

II. TECHNIQUE.

Let us suppose that a number of letters have been obtained from discharged post-leucotomy patients and from their near relatives, describing how the patients have been getting on since they left hospital. Each letter is first read through, and each distinct statement in it separately marked, regardless of any theory as to its interpretation. For reference purposes each statement is conveniently indexed. Virtually the same statement occurring more than once in the same letter is given the same index mark, and is considered as

* Any personality traits described depend upon the character of the person who gives the description, as well as upon the character of the person described. In contrast with the definitions suggested by Allport and others (2), character is therefore probably best defined in accordance with its accepted English usage, as *the qualities which distinguish an individual*, while personality is best defined as *the conative qualities of a person's character as they impress other people*. For the comparative study of reported personality traits, some distinction of this kind seems essential.

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amplifying a single trait. The letters are next classified according to whether they are self descriptions or descriptions given by other people, and sub-classified according to the type of illness from which the person was suffering before the operation.

When all the letters have been indexed and classified, the marked statements in the first letter which comes to hand are entered on a table in a line from left to right against the name of the person described. To reduce the size of the table, abbreviations, with their appropriate indices, can be used. The second letter to hand is treated in the same way, with the exception that each statement in it which resembles a statement in the previously tabulated letter is entered vertically below it, regardless of the order in which it occurs in the letter, while statements which differ from them are entered to the right of the statements previously tabulated. Each subsequent letter is treated in the same way. The classes of letters to be compared are kept separate, but the same order of entering the statements on the table is adhered to throughout. When the table is completed, it gives horizontally all the statements made about one person, and, vertically, the frequency with which similar statements are reported in any class* or sub-class.

For convenience, groups* of similar statements can be given appropriate names. The names used are not intended to be explanatory. They are simply convenient labels, which are themselves explained and amplified by the individual statements in the group. Thus the group name " cheerfulness " can be used to include, and is at the same time explained by, such statements as : " I find after all the world is a nice place to be in," and " Her outstanding qualities now are her gaiety of spirits, her outstanding love of life." It is the contents of the group, its consistency, and the degree to which the various qualities reported confirm and elucidate each other, which is of interest. The group name, if thought more desirable, could be a number. The method is essentially inductive, not deductive. It aims at assessing, from the frequency of its occurrence, the degree to which any quality which is reported can be regarded as typical for a given class, or unique to a single individual, not how far any individual person conforms to a preconceived type, or exemplifies some previously accepted explanatory theory.

As the initial table grows and data accumulate, the original groups in which statements are placed are sometimes found to need subdividing, while others are seen to be virtually the same. It is therefore invariably necessary to revise the initial tabulation. When all the statements have been appropriately grouped, the frequency of similar statements is computed. A table is finally prepared in which the linear statements concerning each person are arranged in column order according to the total frequency with which similar statements occur in the entire population considered. Arranged in this way, the final table shows, on the left, the most typical statements, followed by statements arranged in decreasing order according to the frequency with which they were made, with, on the extreme right, statements which were unique in the

* For clarity in the present communication the terms " class " and " sub-class " are used to refer to the classification of reports according to the patient's clinical diagnosis, etc. The terms " group " and " sub-group " are used to refer to the technique of grouping similar statements together. A " group " is not, as in biology, a subdivision of a " class."

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sense that each was said of one person only. The whole of the original qualitative information is in this way retained. The several statements concerning any one person can therefore be compared with each other. The statements included in any one group can be critically examined. Finally, the frequency with which similar statements occur in the several classes and sub-classes of patients can be compared, and the degree to which they may be regarded as "typical" for the whole population, or "peculiar" to a particular clinical class, can be assessed. For simplicity of exposition, the technique has been described as if all the statements to be compared were entered in order on a single sheet of paper. In a relatively simple investigation this is reasonably possible, and is, in theory, what is always done. In practice it is more economical in the long run to have each statement recorded at the outset on a separate index card. In this way statements to be classified, compared and grouped remain completely fluid and orderly throughout the inquiry, and it becomes unnecessary, at intervals, to re-copy them.

III. Synthesis of the Information.

The qualitative and numerical information obtained can be immediately utilized to build up, for an entire class, a composite picture of the "typical" personality described, arranged in order from the most frequently reported traits to those least frequently described. Thus, Frankl and Mayer-Gross found the typical discharged patient after leucotomy was described as—

"Physically healthy, a good eater and sleeper, with a marked feeling of well-being. His prevailing mood is cheerfulness, he does not worry, is happy and contented, and shows it. He has a high opinion of himself and his abilities. . . . He leads an active life, is restless, likes movement and change. His interests and hobbies are varied and variable, with a preference for light entertainment and superficial pastimes. He is easy-going, a good mixer, fond of social life and of being on good terms with everybody. . . . His relations to the people around him often are without depth of feeling. He shows litttle sympathy or consideration for his next of kin, or for anybody else. He neither regrets nor repents for whatever he may have done or said. He may be self-willed and headstrong, and unable to see the other's point of view. He tends to quickly passing outbursts of temper . . ."

The typical traits observed by other people can be compared with the typical self observations. Thus, for the discharged leucotomy patients:

"Forty-eight letters comment on the patients' behaviour towards their relations, all patients contending that they get on very well. . . . (But) Ten out of 29 relatives who reported on this point found it difficult to live with the patient."

The traits observed in one clinical class can be compared with those observed in another. Thus, Frankl and Mayer-Gross found:

"Eight of the 14 letters mentioning persisting symptoms are from obsessionals and their relatives."

According to one's predilections, the information can be arranged as a purely qualitative description of typical traits reported; as a series of numerical tables giving, for each clinical class, the observed incidence of statements falling into characteristic groups; or as a combination of the two. The

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description of any person can be divided into those statements concerning him which are found to be typical of his class, and those which are unique to him, and therefore distinguish him from the class of which he is a member. From the incidence with which the statements concerning him are typical of his class, a numerical quotient can be computed, indicating the degree to which he can be regarded as typical, and, if considered desirable, subsequently used as a measure of his "typicality." From the statements which are unique to him as an individual, it is possible to show how he differs from his class.

Extending the same technique it is clearly possible to determine the similarities and differences between descriptions of the same people given by different observers. In this way it is possible to determine the typical qualities noticed by observers in general, the particular qualities which any given observer tends to notice in other people, and thence the degree to which any description can be regarded as portraying the character of the person observed, or as revealing the character of the person who makes the observation. This information can be expressed qualitatively as an account showing objective and subjective responses occurring in the descriptions, or numerically as a correlation co-efficient showing the degree of agreement between the reports.

The technique solves a number of problems encountered in personality studies. The present communication describes its application to one of these. The same technique is being used for the comparative study of psychological projection records given by groups of normal and abnormal children, which, it is anticipated, will in due course be published.

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CEREBRAL PHYSIOLOGY AND PSYCHIATRY.

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INTRODUCTION.

THIS contribution is itself introductory to a larger subject, and is an attempt to present some physiological observations in a way that may stimulate the interest of psychologists and psychiatrists. Viewed from a biological standpoint, man is limited in his thinking and behaviour by his innate constitution, anatomically and physiologicallly. As a living, functioning individual he is much more than the mere sum of his parts, yet it is a fact that structurally he is made up of reflex arcs (receptor endorgans, afferent nerves, central nervous system, efferent nerves and effector organs). The vital functions of nutrition, respiration, circulation, excretion, reproduction, locomotion and metabolism are effected by standard types of reflexes which pervade the vertebrate kind, so that a dynamic reflexological approach to normal and abnormal human behaviour should be revealing. Man is stimulated by his total environment to respond as a complete being, and this full activity is retained as experience which modifies subsequent behaviour. That being so, the nature of integration of these reflexes and the ways in which they are influenced by experience constitute a subject very pertinent to the study of psychology and psychiatry. Something of that nature forms the material of this paper.

To ensure a scientific basis, only such observations are noted as have been made personally, on the actual abnormal behaviour of patients or on the investigation of that behaviour through speech with the patients, or more usually by the use of both methods. The observations on the *development* of behaviour were made in the course of investigating the "life history" of patients by interviewing them and their relatives.

The conclusions concerning children were developed at child guidance clinics, but perhaps more fruitfully by informal observations on the families of my friends. The unobtrusive visitor to the home of enlightened parents has a strategic advantage, and is able to observe the spontaneous activities of children, and in discussion with the parents to acquire a more intimate and detailed record.

The interpretation given to the observed facts derives from an appreciation of the experimental studies of various schools of neurophysiology, as is brought out in the ensuing context.

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First of all an outline of differentiation in the Pavlovian sense is given, together with the changes this undergoes with the onset of sleep and in neurotic breakdown. With such understanding of animal behaviour as this affords, instinctual human behaviour is then considered in health and disorder. Next, a physiological interpretation of ambivalent behaviour in psychiatry and the analysis of an actual case from a physiological viewpoint is given. A short discussion of some implications of this work completes the article.

1. Experimental Basis of Differentiation in Animals.

Positive Conditioning.

The approach adopted here is based on the studies of Pavlov (1) and Horsley Gantt (2), and the relevant experiments show that if such a stimulus as the musical note C, lacking any capacity to evoke a stereotyped response, immediately precedes an injurious stimulus which does possess such a capacity, then the former stimulus acquires a new property of evoking the withdrawal response previously produced by the neural impulses of the latter only. This acquired property develops with repetition.

If, after establishing positive properties to the note C one sounds a note adjacent to it, such as D, one finds that D has acquired like properties. The cortical engrams corresponding to notes further removed, such as G, are also positive in lesser measure. The important point of principle here is that through an internal neural process, an inaccuracy in the registration of actual experience has occurred. Because C has positive effect for a vital function, D and G have similar effect in lessening degree. In nature this is valuable, for similar environmental stimuli tend to have similar effect for an animal. However, another function of the cortex—inhibition—tends, with experience, to limit this inaccuracy, and it is effected through negative conditioning.

Negative Conditioning.

If a stimulus which has acquired positive properties acts on the sensorium and is *not* followed by its basic inborn reflex, it develops the negative property of reducing that inborn response. This new inhibitory property is built upon outmoded positives. It develops with repetition.

Differentiation—the Combination of Positive and Negative Conditioning.

If note C is always associated with a painful stimulus, it acquires positive withdrawal effect, and if notes D and G, which have acquired spontaneous positive effect only through internal generalization, are always non-reinforced, they lose this property and then are inhibitory. This combined activity of positive and negative engrams based upon the *same* inborn reflex is called *differentiation*. It will be clear that an increased selectivity to environmental stimuli is effected by this combination, for the cortex now induces positive activity to C and negative activity to D and G (whereas formerly D and G were merely "less positive.").

Cortical engrams thus vary in degree of both positiveness and negativeness, and may work with or against each other according to determinable laws.

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These influence, and themselves are influenced by, the state of the unconditioned centre of the basic reflex system. These interacting processes are constantly changing.

The unconditioned reflex with its positive and negative associations together form the basic unit, structurally and functionally, for the study of neural dynamic changes occurring in biological adaptation.

Differentiation during the Onset of Sleep and in Neurosis.

In the normal waking state a " large " stimulus results in a large conditioned response and a " small " stimulus results in a small conditioned response. During the transition to sleep and in neurotic breakdown, it is found that the cerebral cortex passes through distinct phases of functional activity. The first of these is the *equivalent phase*, in which stimuli of large and small intensities give responses of the same size. This passes into the *paradoxical phase*, in which stimuli of large intensity evoke small responses and stimuli of small intensity evoke large responses. The last phase is the *ultraparadoxical*, where reversal of effect obtains, positively conditioned stimuli then giving negative responses and negatively conditioned stimuli giving positive responses. These phases should be borne in mind when abnormality of the differentiating function is being considered.

2. The Normal and Ultraparadoxical Phases in Instinctual Behaviour in Man.

A child is born with a minimum of learned behaviour from the recency of completion of its nervous system and the constancy of its intrauterine environment. Yet it has the faculty to record conditioned behaviour.

Nutrition.

In the beginning, the stimuli preceding the fufilment of the nutritional function are relatively stereotyped because the food is milk and the source—the mother. The sight of the breast, the contact of the breast with the child's hands, face and mouth, being the most immediate precursors, all become of positive effect. Gradually, the sights and sounds of the mother as an individual become conditioned stimuli to the unconditioned food reflexes. By differentiation, the father and other people, having become positive through internal generalization since they resemble the mother, will tend to become of negative conditioned sign as they are not followed by reinforcement.

As the feeding habits widen in scope a host of olfactory, visual, auditory and gustatory stimuli acquire positive effect as they impinge upon the child's sensorium prior to food. The sight and smell of food and the noise of dishes, the activity of preparation and the sight of others eating are of this category. There is, therefore, another group of objects which acquire positive effect through internal generalization arising through the resemblance they bear to actually positive objects of food and drink. So faeces and urine, solid and fluid poisons, blankets, clothes, hands, toys and other objects, coal and dirt, slops and soap, after acquiring this positive significance (for the child puts

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these to its mouth without discrimination) undergo negation by differentiation. The child's sensorium is stimulated by them, yet the child is prevented from eating them, so by non-reinforcement they become negative. In this way the mature differentiated systems in the adult are built up through a long process of development from childhood, and one system supersedes previous systems as living conditions change.

It is evident that the mature cerebral cortex has in the course of its existence built up differential systems through experience based upon the instinctual functions. These systems ensure that the organism, in adapting its vital functions and the environment to each other, works realistically in accordance with its previous history. It will clearly respond positively in one environment and negatively in another.

Mental health is characterized by just such efficient adaptation. The change occurring in the differential systems in the severe mental disorder schizophrenia is one of partial or complete reversal, and the syndrome is the expression of a cerebral cortex in the ultra-paradoxical phase. These cases are generally described as having lost all interest in their former pleasures and pursuits on the one hand, on the other as having depraved, suicidal or anti-social habits. These are but two inseparable aspects of the one phenomenon —differentiation—for by reversal in the course of intracortical disfunction, the subject responds positively in a situation that is negative in his total experience, and negatively (by inhibiting a response) in any situation that is positive in his experience. These reversals of acquired differential systems based upon inborn reflexes take many and various forms. Though determined by the individual experience of the subject, they do conform to general type, as is shown by the following behaviour patterns which are commonly observed in mental hospital practice.

In nutrition, food and drink assume a negative effect and the patient refuses to eat and inhibits digestive secretions, treating the food as dangerous and disgusting. Poisons, faeces and urine, clothes, hands, dirt and many other articles normally of negative moment through differentiation become of positive sign for feeding and are treated accordingly. A mother or mother-object will also become negative for nutrition and may then be regarded as a poisoner. Sometimes clear-cut reversal of positive and negative associations does not develop, but the tendency to such a state exists in the form of mixed associations. Such patients respond to food as if it were contaminated or poisoned by some agent or substance.

The above is a brief outline of the development of conditioned differential systems and their complete or partial breakdown as illustrated in the nutritional responses. The analogous processes in the remaining groups of reflexes fall to be considered.

Excretion.

The defaecating and urinating reflexes fulfil the excretory function (excluding the actual secretion of urine and sweat). The adequate unconditioned stimuli are distention of the rectum and the urinary bladder. The response is voiding of these viscera through muscular action, i.e. contraction of the

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extrusors and relaxation of sphincters. Training consists in placing the child in a suitable environment prior to the action of these reflexes. The mother thus, in a young child, becomes a positive condition for these functions, and the sight and touch of the lavatory or chamber pot will become immediate conditions. By differentiation, the clothes and bedding, floor and furniture become of negative effect. These objects, initially positive by internal generalization or by actual experience, undergo inhibition by non-reinforcement in training.

In the ultraparadoxical phase, clothes, beds, floors and so on acquire the property of evoking the response of voiding, and that this is not merely incontinence (i.e. uncontrollable defaecation or urination) is observed in the "purposefulness" and "deliberateness" of the behaviour. On the other hand, the lavatory, commode or bedpan tend to negative sign, and the patients are said to be restraining the act or to be "holding themselves in" when placed in what are normally appropriate conditions for excretion.

Locomotion.

The locomotor function is constituted by all reflexes resulting in movements destined to preserve the life or integrity of the organism. Thus stimuli, injurious to the skin causing withdrawal of the part; loud noises causing starts; sudden visual stimuli causing protective motor responses; proprioceptive stimuli causing as their inevitable response maintenance of any passive or active movement; grasp and other prehensile reflexes; the phasic reflexes in walking, trotting, running and galloping—all these constitute the locomotor function.

Dangerous objects become, then, of positive moment for the locomotor function and excite withdrawal movements. The total environmental stimulus constituting safety and comfort, by differentiation, acquires negative effect, and inhibits movement away from safe and comfortable environments towards danger. Such positive and negative behaviour is advantageous for survival. In these reflexes it is important to distinguish clearly between positive and negative conditions. Many behavourists tend to confuse a physiologically positive conditioned stimulus based on this reflex system, and resulting in movement away and unpleasant feeling tone (e.g. flexor reflex) with the physiologically negative which, in reality, results in *no* response or the lessening of an already existing response.

Positive conditioned stimuli arise from objects which impinge on the sensorium prior to injury, spankings, overbalancing and so on. Wall, tables, windows, furnishings, fires, electrical, gas and other heating and lighting equipment, stairs, motors, streets, railways, bridges, rivers, water, heights, uncomfortable postures, falling out of bed and many more such factors acquire positive sign by direct experience, or indirectly through warnings and training on the part of adults. Negative stimuli based by differentiation on the locomotor reflexes arise from factors such as constitute safe and comfortable postures, absence of the above dangerous objects—for such situations constitute a stimulation of the sensorium just as material as the disturbing factors which are positive.

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It becomes clear how differentiations based on the locomotor function (excluding the highly developed systems involved in manipulatory and speech behaviour) determine the movements not merely avoiding danger and injury but also those maintaining safety and integrity. The value of this twofold conception becomes evident when reversal of the biological significance of environment is dealt with in functional disorder as in the ultraparadoxical phase.

This phase of the cortex determines excitatory responses away from safety and comfort towards danger and injury, and inhibitory responses maintain a state of constant danger. Therefore walls, tables, windows, fires, etc., as enumerated above become of negative sign for self-preservation, while objects constituting a safe, comfortable and pleasing environment become of positive sign. The abnormally functioning cortex through internal reversal of its orientating, guiding influence upon the inborn reflexes impels the subject to court danger and death and, as he would normally avoid these, so he avoids security and ease. Such complete reversal is only obvious periodically as "impulsive suicidal outbursts" in a chronic case, or more continuously in cases classified as "acute schizophrenic breakdowns." More characteristic of the confirmed schizophrenic is the inactivity which results from the mixed associations which reveal the tendency towards the ultraparadoxical phase. Here any given environment excites movement and at the same time inhibits movement, and relative inactivity ensues.

Respiration.

The respiratory function consists of reflexes of inspiration, expiration, coughing and sneezing. Respiration is naturally maintained by the subject taking measures to ensure the free supply of air. The ultraparadoxical phase may cause the subject to avoid air and attempt suicide by suffocation, drowning, strangulation, choking or gassing.

Circulation and Metabolism.

Some systems of reflexes are difficult to analyse in terms of reversed differentiation, since responses are not readily observable clinically. Such are the circulatory and metabolic systems. The former is effected by many reflexes. Briefly there is throughout the whole body a mass of effector units controlling the rate and output of the heart and relative tone of the arterioles, so achieving a distribution of blood according to the needs of the moment. These reflexes, like the respiratory, are not subject to inhibition to the extent of extinction; yet the response patterns are attuned to environmental changes. Abnormal responses are made in functional disorder.

The metabolic function is complex, and in its conditioned reflex aspect is difficult to analyse. Emergencies, hot and cold surroundings, evoke reflexly, responses maintaining the constant "milieu interne." When food and fluid are ingested, digested and absorbed, such substances as insulin are secreted to effect assimilation. Fluid intake usually preceding as it normally must, the renal secretion of the resulting excess of fluid in the body actually conditions its own excretion. These are some of the known reflex mechanisms of

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metabolic importance. It is a fact that many of these deep reflexes can be conditioned positively and negatively. The severe physical effects such as loss of weight and "toxaemia" in mental disorders are partly accountable to functionally disordered metabolic reflexes.

Reproduction.

The reproductive function is fulfilled by three systems of inborn reflexes. Firstly there are the reflexes associated with menstruation and ovulation, gestation and parturition. These are not so obviously subject to conditioning but are to a varying degree.

Secondly there are the lactational reflexes ensuring a food supply for the infant. It has already been indicated that the mother becomes of positive sign (for feeding) to the child in this relationship. It is also true that the child is of positive sign to the mother for lactation, because visual, auditory, tactile, proprioceptive and olfactory stimuli originating from the child and impinging on the mother's sensorium precede the stimulation of the nipple receptors and the inborn reflex secretion of milk. This means that stimuli from the child evoke secretion of milk and that, at weaning, the child becomes of negative effect to the mother for lactation and the cortical engrams of those stimuli undergo negation. Hormonal secretions are also subject to conditioning.

The third system is formed by the sexual inborn reflexes. The chief receptor end-organs which, on stimulation, evoke the motor and secretory, effects of the sexual response are located in the genitals. The direction of adaptation in human behaviour, through cortical differentiation based on sexual reflexes, can be traced in a composite life-history.

It is commonly observed that infants are capable of rudimentary sexual responses evoked by stimulation of the sexual surfaces, and subthreshold states of activity at the motoneurones must be included too. In the course of bathing, fondling and kissing, the mother becomes of positive sign for the sexual function. However, since it is the custom of most parents to discourage any habits of self-manipulation from developing they soon become of negative sign for sexual activity, for their presence is always linked to an absence of such reflex behaviour. In childhood, therefore, parents tend to become of negative sign, while isolation—which is an environmental stimulus—is positive for the sexual function.

As the child's behaviour widens in scope, inanimate objects such as toys or living things such as domestic pets and playmates in so far as any of these objects accidentally are associated with stimulation of the sexual surfaces, acquire positive effect for the sexual function and take their place alongside isolation as positive factors. The parents and others, who frown and forbid sexual play, however gently, however brutally, are of negative sign.

In growing older there is a definite tendency for the sexes to separate socially, in the home, at play and in school. This means that the possibility of homosexual conditioning is increased. The mild and incidental sexual behaviour characteristic of this age takes place *in the presence* of people of like sex, and does not take place or takes place less often in the presence of people

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of opposite sex. Further, the subject's own person—a homosexual object—probably acquires a sexual sign through self-manipulation.

Such a homosexual differential system is often succeeded or replaced by one in which persons of the opposite sex are differentiated into two groups —a negative consisting of mother and sister objects for a male or father and brother objects in the case of a female, and a positive group made up of people of the opposite sex who are, in some distinct way, unlike the above negative objects. Subjects, during this stage, may be orientated positively to their " social and intellectual inferiors or superiors," or to those with some age or racial disparity.

Gradually, however, with the unfolding potentialities of developing body and mind and with the moulding influence of social factors, the mature conditioning to the opposite sex assumes the chief importance on the positive side of the differential system. Thus friends of the opposite sex assume potentially a positive effect for sexual function, and ultimately this is differentiated to the wife or husband. Parents, brothers and sisters, teachers, friends of the same or opposite sex, and all inanimate things which have through internal generalization or through actual experience been positive at any time in previous life, tend to become, through non-reinforcement, of negative sign. Environments constituting privacy being usually a precondition to sexual activity in all its stages are usually of positive effect, while public surroundings and company are negative for sexual function.

It will be recognized that, in this "life history" of the mature differential system based upon the sexual reflexes, there rest the seeds of many kinds of perversion—incestuous attachments, fetishism, homosexuality, auto-eroticism, exhibitionism, scoptophilia, etc.—and these seeds grow only with perverted experience on *both* the positive and negative side of differentiation. The non-reinforcement of the inborn sexual reflexes after the sensorium has been stimulated by a "normal love object" (e.g. in a male subject, a mother or sister, who, having all the attributes of females, are yet of negative sign for the reproductive function) is as important a perverting factor as actual reinforcement of these reflexes after the sensorium has been stimulated by an " abnormal love object." The former perversion by negative conditioning, though just as real, physiologically speaking, as the latter by positive conditioning, is much less obvious. It only results in inhibited behaviour, and not in outwardly expressed behaviour like the latter. Even normality, however, is subject to much variation in the duration and therefore the strength of these developmental differential systems, which may theoretically vary from zero or non-existence to lifelong deviation according to individual experience.

Having built up the mature differential system, however, living conditions still continue to change. The positive object for sexual function may cease to be reinforced by the unconditioned reflex system (from separation by death and by military or economic need or from incompatibilities of various kinds). In this case the positive object undergoes negation, and by a process of mutual induction the hitherto negated objects tend to become positive—the phenomenon commonly termed regression. The mature differential system esta-

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blishes itself once more when the positive object which was tending to become negative is again associated with the sexual reflexes when normal living conditions are restored.

In the ultraparadoxical phase reversal of differentiation appears. If all objects that are normally, in the mature adult, of negative effect through differentiation are enumerated—parents, doctors, teachers, brothers, sisters, friends of the same or opposite sex, autoerotic practices, inanimate objects and public surroundings—it is clear that all of these may become of positive moment in a spurious kind of way. The resulting conditioned behaviour is usually observed clinically as "shamelessly erotic." Conversely, objects of positive sign become negative and the subject's behaviour is inadequate sexually. The tendency to the ultraparadoxical phase is shown in the confusion of positive and negative associations appearing clinically as "chaotic sexuality," under which heading Rosanoff (3) actually describes schizophrenia. Phantasies of mixed sexuality are the subjective manifestation of this, and such delusions of changed sexuality like menstruation in a male or amputation of breasts in a female are indications of the sexual disorientation.

3. The Equivalent and Paradoxical Phases of Instinctual Behaviour.

In the earlier part of this paper an attempt was made to outline normal differentiation, and to present its tendency to reversal in its schizophrenic or ultraparadoxical phase. The nutritional instinctual reflexes were used to illustrate these processes, and their manifestations in other systems were afterwards dealt with. Attention was, however, drawn to two other phases —the equivalent and the paradoxical. Unlike the reversal that obtains in the ultraparadoxical phase, where negative stimuli evoke positive responses and vice versa, in the paradoxical phase stimuli of large intensity evoke small responses and those of small intensity evoke large responses. In the equivalent phase, stimuli of large and small intensities give equal responses.

If schizophrenia is the clinical manifestation of the cerebral cortex in a pathologically fixed ultraparadoxical state (for the equivalent, paradoxical and ultraparadoxical states of hypnosis normally occur *transiently* between sleeping and waking), what of the equivalent and paradoxical phases? The former is manifest clinically as melancholia and the latter as mania. Obsessional states, anxiety and hysterical states are the lesser encroachments of whatever pathophysiological processes cause this fixity of the cerebral cortex.

Of course, each element of the cortex as a mosaic of functioning units has its own history and, in consequence, in any cortex there will be evidence of any or all of these hypnotic states existing simultaneously side by side, and this is evident clinically as "mixed states" or "alternating states" described in classical psychiatric works. It is occasionally observed that cases pass through obsessional and anxiety states to melancholia, to mania, and then to schizophrenia. This may be otherwise stated as manifestation in behaviour

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of a cortex passing through minor degrees of pathological fixity to the equivalent, paradoxical, and finally to the ultraparadoxical phase.

4. The Pathophysiological Point.

The above normal and abnormal orientations based upon the instinctual reflexes are common observations. Another group of observations which is generally accepted as characteristic of the subjects of breakdown requires consideration. This concerns the ambivalence manifested by the injury or killing of some loved object or the flight from it. The pathophysiology of this behaviour is of a different order from that described above.

In an animal suffering from an experimentally induced breakdown, it is possible to identify the source of its difficulty by its behaviour. Thus, such an animal will attempt to flee from the experimental situation (Pavlov (1) and Horsley Gantt (2)), and if forced to remain in its trappings it attempts to bite the pathogenic stimuli (metronome, bell, etc.). The animal is indeed ambivalent towards these stimuli, since it responds to them positively or negatively according to its conditioned experience but, on the other hand, attacks them or avoids them in so far as they disturb normal functioning.

Applying this interpretation to ambivalence in psychiatry, it may be stated that the subject responds positively and negatively to environmental objects according to its experience but, to whatever extent these positive and negative objects are the source of pathogenic conflict, they are attacked or avoided. The fact that so often in mental disorders there is flight from people (running away from home, solitariness, roaming at night and taking to bed during the day, hiding of the face) or aggression towards people (homicidal attacks, quarrelling) is strong evidence that adaptation to persons is the source of difficulty. The subject's interpersonal relationships are ambivalent, because people are of positive or negative sign for instinctual functions on the one hand, and on the other they constitute pathogenic stimuli to the subject so that protection is imperative.

The " generalization " of a pathogenic object whereby ambivalent behaviour initially specific towards one person extends to people in general is a result of dedifferentiation and occurs also in experimental neuroses, where the animal is disturbed not merely by the specific stimulus which caused the breakdown, but by all similar stimuli. Such generalization is a different process from " internal generalization," which was mentioned at the beginning of this paper.

The complete parallel between animal and human disorders may now be outlined. In animals, responses to a pathogenic stimulus are ambivalent, and the character of other responses shows that the cerebral cortex is in an equivalent, paradoxical or ultraparadoxical phase. In human beings behaviour regarding people is ambivalent, and instinctual behaviour conforms to a pattern that is typical of the equivalent, paradoxical, or ultraparadoxical phases. In animals we know that the pathogenic stimulus *caused* the abnormal phases in the cortex. It may be deduced that in human beings persons have become pathogenic by analogous processes to the above-mentioned experimental stimulus, and so cause neuroses, melancholia, mania and schizophrenia.

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5. Illustrative Case.

G. S—, aged 40, male.

This patient being intelligent and co-operative, and having insight into his abnormality at its early stages, is a good subject for investigation. The material is given in a question and answer form so that others may judge for themselves the nature of an investigation in terms of neurophysiology. Only a short sample is given, but it was from such investigations (by means of speech) and from observations of actual behaviour clinically that the observed facts forming the substance of this work were collected. The interpretation of the facts as given in the interpolated notes is based on modern concepts of nervous function.

From First Interview.

Q. What was wrong with you at first? A. "I was severely run down by electrical charges." Q. What did these charges do to you? A. "They made me very sick. There is a tightness in your head. They played with various organs later on in C ward." Q. Which organs? A. "Every one bar my heart—they did not tamper with my heart." (*Note.*—Experimental work shows that a pathophysiological point in the cerebral cortex influences the function of the rest of the cortex in an abnormal fashion. The patient expresses the subjective aspect of this total disorder.)

Excretory system.—Q. You said the charges affected your organs. What effects do they have on the actions of your organs? A. "They can either retard the matter or bring it out with a rush or pleasantly" (i.e. normally, on further questioning.) (*Note.*—He expresses all degrees of influence on the bowel from positive, through neutral to negative.) Q. That is the bowels of course. Does it affect the urinary bladder? A. "After a great deal of charges there was an extra amount of urine came out and they can make it feel full or empty." Q. Do the charges affect the *action* of the bladder? A. "They make you feel as if you required to pass urine." Q. Can they stop the bladder from working? A. "Yes, for a little while. Only the determination to get rid of the urine beats the actual waves." (*Note.*—The influence on the bladder is less marked but recognizable.)

Nutritional system.—Q. You said the charges could make you sick. What other influence do they have on feeding? A. "They can make you feel you want more than you really require. They can tighten your jaws and make you so miserable you do not want to eat. They always ease off and let you have your food." (*Note.*—This illustrates the tendency of positive food objects to undergo negation in the ultra-paradoxical phase.) Q. When? A. "At the usual hours." (*Note.*—Summation of a "time" conditioned reflex stimulus may account for this.) Q. What effect did they have on the foods you were not very keen on? A. "As long as they were good [i.e. wholesome, plain, on further questioning] you relished them more. Sometimes they deadened the taste of sweet things like chocolate. Sometimes you had your normal likes and dislikes." (*Note.*—This is a very interesting statement of his awareness of the paradoxical phase for strong positives, e.g. chocolate becomes weak, and weak positives, e.g. plain food, become strong. He also indicates the fluctuating nature of the abnormal with the normal phases—a phenomenon frequently noted in experimental work.) Q. Did you ever have these charges causing you to eat something you should not eat, e.g. poison or filth? A. "The nearest I got to that was tainted water used in the soup, but it had no ill effects." (*Note.*—The tendency to the ultraparadoxical phase is illustrated by a mixture of negative with positive signals.) Q. Does it affect saliva? A. "Yes, it can make the saliva flow more than usual or come out suddenly. It never holds it back—only increases it."

Reproductive system.—Q. What effect do they have on your sex organs? A. "They extract the reproductive fluid." Q. How? A. "They make your penis rigid and extract it slowly or else in a rush." Q. Have you any thoughts when this happens? A. "You only wish they would leave you alone. They pester you." Q. Do they affect your sex? A. "You are always conscious of being masculine." Q. Do they ever try to make you a woman? A. (*Smiling*) "They have tried that but have not managed. You always feel your own sex." Q. In what way did

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they try to make you a woman ? A. " They tried to make me believe I had a womb inside me and they put some pleasant charges down the left side of my body. They can make you lose your identity just for a moment." Q. And when you lose your identity, are you without a sex ? A. " No. You still have a sex—your own. They try to make you as Satan, and he is sexless, but you still retain your feeling of sex." (*Note.*—The tendency to the sexual disorientation by reversal is illustrated by " mixed phantasy.")

Pathophysiological point.—Q. Who works this ? A. " You get the impression there are men and women." (*Note.*—The source of the disorder lies in people.) Q. Do you want to attack or run away from these charges ? A. " You wish they would leave you alone to your natural life. I tried to hang by the arms from a tree to break the current, but it was just the same—it kept contact. I went bus runs to see if distance would break it. I stood on a rubber mat too." (*Note.*—He attempts to avoid the source of disorder.) Q. It seems to be something you try to avoid, then ? A. " Oh yes. It is not pleasant—your thoughts being listened to." Q. Have these charges ever caused you to attempt suicide or to do yourself injury ? A. " They have never caused me, but they have given me the feeling, I should like to hit my head on the corner of a table or something—on a wall—anything that will hurt. You want to try that but dismiss the idea from your mind. An inclination to kick someone else to relieve your feelings." (*Note.*—He, being a person (even to himself in so far as he sees himself in mirrors, or sees, smells or touches his own body) is a source of disorder, and so is attacked as others are. The reversal of locomotor conditioned reflexes is also illustrated since walls and tables are " to be avoided " but he " is impelled towards them.") Q. Would a table do ? A. " No, It would have to be a living person." (*Note.*—The specific need to attack people is shown.) Q. Have you been troubled by them long ? A. " Electrical charges started two days before admission. I was in one job at 23 years and people thought I had lost my identity, and they thought I required sexual intercourse to get my nervous system into working order. Q. Did you think they were right ? A. " No. I knew positively that they were wrong. I was very much annoyed with them." Q. Men or women ? A. " Both. Women went through the motions of sexual intercourse to keep me in mind of it and men spat on the pavement to suggest reproductive fluid." Q. What did this mean ? A. " That I have intercourse with a girl I worked with, whom I admired. She was eighteen and too young to marry, and was not shy enough. She was too bold."

Locomotor system.—Q. Does it affect your muscles ? A. " It can cause cramps in your thighs, under your chin and fingers."

From Second Interview.

Excretory system.—Q. Did these electrical charges ever cause you to soil your bed ? A. " They used to cause dreams causing emissions." Q. But to soil your bed with faeces or urine ? A. " No, just reproductive fluid." (*Note.*—There is no clearly marked ultraparadoxical phase in the excretory system judging by these answers.)

Pathophysiological point.—Q. Did you want to get away from the people who caused these charges ? A. " Yes." Q. Why ? A. " It is very annoying people listening in to your brain and tampering with your body." Q. How did they tamper with your body ? A. " Playing with the different organs of your body and muscles." (*Note.*—I.e., glands and muscles or effector system.) Q. Could you say exactly what you mean by " playing " ? A. " Improve the action or retard it."

Nutritional system.—Q. Those people used to annoy you when you are eating. Did they want you to think your food was poisoned ? A. " No, not poisoned—just dirty with things off the floor and matter from other people's bodies." Q. What kind of matter ? A. " Bowel matter or other people's saliva." (*Note.*—The admixture of negative effects with positive is clearly shown.)

Pathophysiological point.—Q. Did you ever want to attack those people who caused the charges ? A. " Yes, you felt like doing them harm." Q. Do you think it would have helped your brain to have got them out of the way ? A. " Yes, you would be relieved very much." Q. You told me you had impulses to hurt yourself ? A. " You get the impression that you would be better off with a natural hurt, like

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clawing your face or biting your hand." (*Note.*—The need to attack persons, including himself, is indicated, and this patient actually injured himself in the above manner.)

Analysis.—Since it is people who are attacked or avoided in this case, the opinion may be stated that the nervous system of this patient functions abnormally because people (in so far as they are conditioned signals which have been combined in some formation which is pathogenic) become the factor constituting a nervous strain. Such signals induce the abnormal phases in the remainder of the cerebral cortex, and evidence of this appears as abnormal behaviour responses. People thus do interfere with his normal functioning, and that he believes this influence to be " electrical " is merely an expression of its power over him, his inability to understand its true nature and his fear of it.

6. Discussion.

It may be truly said that contemporary psychiatry has been stirred by the striking successes in methods of physical treatment. Sargant and Slater (4) express this well in the first sentence of their well-known book—" It is a remarkable fact that, despite the popular notion that psychotherapy is the only method of treatment of psychological conditions, most of the big advances in psychiatric therapy have been along somatic lines." It is significant that they also give a quotation from the Goulstonian Lectures of 1870 given by Henry Maudsley, who surely expresses the beliefs of another generation when psychiatry in this country was undergoing vigorous change—" The observation and classification of mental disorders have been so exclusively psychological that we have not sincerely realized the fact that they illustrate the same pathological principles as other diseases, are produced in the same way, and must be investigated in the same spirit of positive research. Until this is done I see no hope of improvement in our knowledge of them, and no use in multiplying books about them." We, to-day, are indebted to this generation for elevating the care of the mentally ill to an unprecedented level of humanity and efficiency, and for advancing our knowledge of the physiology, anatomy and pathology of the nervous system which elucidated the nature of such mental diseases as are recognized now to be of nutritional, organismal, toxic, endocrinal and traumatic origin.

There is no question of psychiatry finishing up where it began, however, because, side by side with that old and new knowledge of soma there grew up a vast body of collected facts and more or less accepted theory—the product of the parallel development of psychology which to-day comprises many schools. Psychiatry has been greatly enriched by the development of psychology, and has in turn, by its own contributions, repaid its sister science.

From time to time, we feel constrained to take stock of new knowledge of soma and psyche and venture to form new hypotheses on this age-old mind-body problem. The present day is such a time for, with the increasing interest in psychosomatic medicine and the broad biological outlooks that are felt to be necessary for full understanding of the medical sciences, the controversy has been thrust into the fore-ground of the contemporary scene. Monism, dualism, epiphenomenalism, psychophysical parallelism and other workable and unworkable compromises have their protagonists. It appears,

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however, that the mind and body have to be one in the meantime—at least, if numbers determine such issues. This decision springs from the countless examples of interconnectedness of mind and body, familiar to all students of humanity. Perhaps our knowledge is inadequate, however, for final decisions. There is still a need for a further parallel development of physical and psychological approaches with profit to both, and if it can be found in what way or ways mind and body are interconnected or are one, a great step forward will have been taken.

The problem of consciousness or mind has been avoided in this paper, which is more concerned with behaviour and the intraneural processes which are believed to accompany it. It has been our aim to observe animal and human behaviour in normal and abnormal function and to detect fundamental parallels. These are so striking in our view that it is felt that they demonstrate a certain degree of identity of functions between the nervous systems of animals and of man, especially in the lower instinctual functions.

It is interesting to note the convergence of physiological and psychological views on interpersonal relationships. For example, the stimuli constituting the mother-object in the child's nervous system and oral stimulation precede both the arousal of the nutritional reflexes and the infantile sexual reflexes. Again, the stages in the development of the sexual differential system are strikingly like accepted systems of psychosexual development. While it would be false to maintain that we are dealing with identical matters, nevertheless, we feel that they are significantly related. In so far as ambivalence to persons manifests itself in behaviour, we again observe similar conduct in animals with induced neuroses. This observation is admittedly a bold one but the implications are interesting, for the isolation of an ambivalent behaviour pattern in taking a clinical history can form the clue to the root cause of the disorder. For example, if the behaviour of a patient shows aggression towards or avoidance of another person (such as parent or spouse) upon whom there is instinctual dependence, then we can say they (as stimuli) are the source of the nervous dysfunction. In this way abnormal behaviour assumes a certain rationality, or at least has utilitarian value for the subject, since it removes the source of trouble (if he destroys or chases people away) or removes him from the trouble (if he avoids people).

These interesting parallels between appearances in clinical psychiatry and experimental pathophysiology have the important implication that a great mass of physiological work which at present is considered rather of the "pure science" category becomes relevant for psychiatry. The known ways of disrupting normal nervous function in animals afford a method of isolating the etiological factors in mental disorders, and the specific knowledge thus acquired suggests a prospect of *specific* physical methods of treatment which would help to reconcile the divergent schools of psychiatric thought.

I am indebted to Dr. Ronald Stewart for permission to publish this article, and wish to thank Dr. W. M. Ford Robertson and Dr. D. G. Munro for helpful suggestions.

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NORMAL CHANGES IN THE MENTAL ABILITIES OF ADULTS AS AGE ADVANCES.

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I. Introduction.

It is generally recognized that the capacity to grasp new ideas and learn new methods of work depends partly upon a person's intelligence and partly upon his age. It is also recognized that over-taxing a person's capacity to acquire new methods of work, or inadequate opportunities for a person to develop the capacity he possesses, are sources of dissatisfaction, mental strain, and sometimes physical complaints amongst normally healthy people. There is even reason to believe that amongst less healthy people they contribute towards disaffection and illness.

During 1944–45 the G.P.O. Engineering Department, Scotland, and Messrs. ———, Ltd., London, asked permission to use mental tests which they thought would assist them to select, in economic proportions, suitable staff to meet the requirements of their organizations. These requests opened a matter of considerable psychological interest. The G.P.O. Telephone Service and Messrs. ——, Ltd., are branches of industry requiring men capable of acquiring specialized training. The greater part of the staff of each is recruited in youth, and remains in the same organization until the retiring age of 60 to 65. The chief difference between them is that one is a national monopoly, the other a competitive industry. The two requests therefore offered a unique opportunity for a comparative study of the distribution of mental ability in a competitive and non-competitive industry, and for assessing, with considerable accuracy, normal changes in mental ability with age.

For these reasons the Crichton Royal Department of Psychological Research asked the G.P.O. Headquarters and the Directors of Messrs. ———, Ltd., for their co-operation in an investigation designed to provide information concerning the assessment of general trainability and normal variations of this ability with age. The requests received the support of the administrative and staff sides of each organization, and in 1946 a plan for two exactly parallel surveys was put into operation.

The agreed object was :

(*a*) For the organizations co-operating to obtain information concerning methods which would assist them in recruiting the right kind of staff in the right proportions without making excessive demands upon people not naturally equipped to meet them, and without training men of good ability in such numbers that their chances of promotion would be unduly delayed. This aspect of the investigation is reported elsewhere (1).

(*b*) For the Crichton Royal to obtain information concerning normal changes in the intellectual abilities of adults as age advances, and statistical

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data which would contribute towards standardizing the tests they wished to use.

II. The Men Tested.

At meetings with the staff of each organization the reasons for the investigation were explained to the men. To secure their co-operation, even if they thought they were less able than other men, it was also explained that a method would be used whereby those volunteering to do the tests need not put their names on their test papers. Information concerning each person's age, year of entering, grade of occupation on entry and present work was provided for the entire male staff of each organization. This information was coded and recorded in advance on each volunteer's test record form. In this way it was possible to classify the men according to the kinds of work in which they were engaged, and to compare the men tested with the remainder of the staff in their own organization, and with men engaged in any other occupation (1).

Table I shows, for each five-year age group between 15 and 65, the number and percentage of men in each organization who did the tests, and the relative size of each age group in the sample. As age advances there is seen to be a slight decline in the percentage of people who volunteered. Minor fluctuations in one organization are in most cases offset by fluctuations in the other, except for the group of men over 60 years of age. For both organizations this group is too small to be considered adequate. The engineers show an unusually high proportion of men in their 30's. Table II shows the number and percentage in each occupational group who did the tests, and thence the degree

Table I.—*Distribution of Volunteers According to Age.*

Age group.	G.P.O. Engineers.			Messrs. —— Ltd., male employees		
	Number tested.	Percentage of staff.	Percentage of sample.	Number tested.	Percentage of staff.	Percentage of sample.
15–19 years	91	55	9	78	30	8
20–24 ,,	88	53	8	52	27	6
25–29 ,,	151	45	14	114	36	12
30–34 ,,	231	45	22	128	32	14
35–39 ,,	162	38	15	122	30	13
40–44 ,,	90	40	9	144	30	16
45–49 ,,	87	39	8	116	30	12
50–54 ,,	85	51	8	70	24	8
55–59 ,,	49	32	5	67	35	7
60–64 ,,	13	23	1	29	18	3

Table II.—*Distribution of Volunteers According to Occupational Group.*

Occupational group.	G.P.O. Engineers.			Messrs. —— Ltd., male employees.		
	Number tested.	Percentage of staff.	Percentage of sample.	Number tested.	Percentage of staff.	Percentage of sample.
Directive or executive	85	57	8	34	32	4
Workmen (highly skilled)	234	48	22	159	34	17
Workmen (skilled)	328	40	32	242	32	26
Workmen (qualified)	296	39	28	240	34	26
Unskilled workmen	54	39	5	153	20	16
Youths-in-training without skilled date	50	52	5	63	40	7
Unclassified assistants, etc.	—	—	—	29	22	3

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TABLE III.—*Distribution of Volunteers According to Method of Entry.*

Occupational grade.	G.P.O. Engineers.			Messrs. —— Ltd., male employees.		
	Number tested.	Percentage of staff.	Percentage of sample.	Number tested.	Percentage of staff.	Percentage of sample.
Youths	359	49	34	101	34	11
Unskilled workmen	384	38	37	520	27	57
Skilled workmen	266	43	25	262	33	28
Academically trained men	38	51	4	37	39	4

TABLE IV.—*Present Ages of Staff Recruited as Youths.*

Present age.	G.P.O. Engineers.		Messrs. —— Ltd., male employees.	
	Number tested.	Percentage of total staff.	Number tested.	Percentage of total staff.
16–19 years	85	67	27	26
20–24 ,,	79	53	24	41
25–29 ,,	95	45	21	35
30–34 ,,	22	55	13	33
35–39 ,,	12	33	11	65
40–44 ,,	9	26	1	—
45–49 ,,	34	53	3	—
50–54 ,,	23	53	—	—
55–59 ,,	—	—	1	—

TABLE V.—*Age at, and Year of Entry of Staff Recruited as Unskilled Workmen.*

G.P.O. Engineers:

Year of entry.	Age of entry in years.										Total for year of entry.
	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	
1902–06	1	—	—	—	—	—	—	—	—	—	1
1907–11	7	2	—	—	—	—	—	—	—	—	9
1912–16	2	9	4	—	—	—	—	—	—	—	15
1917–21	—	9	7	1	1	—	—	—	—	—	18
1922–26	—	6	13	4	2	—	—	—	—	—	25
1927–31	—	2	4	1	2	—	—	—	—	—	9
1932–36	1	54	55	28	11	5	—	—	—	—	154
1937–41	1	43	25	17	7	4	6	5	—	1	109
1942–46	—	5	10	14	5	1	1	5	—	3	44
Total for age of entry	12	130	118	65	28	10	7	10	—	4	384

Messrs. ——, Ltd., Male Employees:

1902–06	2	—	—	—	—	—	—	—	—	—	2
1907–11	5	3	—	—	—	—	—	—	—	—	8
1912–16	7	3	2	2	—	—	—	—	—	—	14
1917–21	5	6	2	3	2	—	—	—	—	—	18
1922–26	10	9	7	—	2	1	—	—	—	—	29
1927–31	25	19	13	7	5	1	1	—	—	—	71
1932–36	34	19	19	18	5	1	—	—	—	—	96
1937–41	51	19	16	19	9	19	20	9	..	2	164
1942–46	50	4	10	9	10	12	8	9	5	1	118
Total for age of entry	189	82	69	58	33	34	29	18	5	3	520

to which each sample can be regarded as a representative cross-section of the entire organization. Table III shows, for the men co-operating, the numbers who entered each organization as boys, as unskilled or as skilled workmen, and as men with technical or University qualifications. Table IV shows the present ages of the men who entered each organization as boys. Amongst the engineers, some of these are now over 50 years of age. For Messrs. ——, Ltd., the group is much smaller; at present they are nearly all under 40 years

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TABLE VI.—*Age at, and Year of Entry of Staff Recruited as Skilled Workmen.*

G.P.O. Engineers:

Year of entry.	Age of entry in years.										Total for year of entry.
	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	
1902–06	1	—	—	—	—	—	—	—	—	—	1
1907–11	2	1	—	—	—	—	—	—	—	—	3
1912–16	5	8	6	2	—	—	—	—	—	—	21
1917–21	—	1	—	—	—	—	—	—	—	—	1
1922–26	—	6	2	1	—	—	—	—	—	—	9
1927–31	—	2	1	—	1	—	—	—	—	—	4
1932–36	2	31	16	10	5	2	1	—	—	—	67
1937–41	2	51	45	19	4	—	1	—	—	—	122
1942–46	—	1	12	16	6	2	1	—	—	—	38
Total for age of entry	12	101	82	48	16	4	3	—	—	—	266

Messrs. —— Ltd., Male Employees:

1902–06	2	—	—	—	—	—	—	—	—	—	2
1907–11	—	1	2	—	—	—	—	—	—	—	3
1912–16	2	3	5	—	—	—	—	—	—	—	10
1917–21	3	2	3	3	—	—	—	—	—	—	11
1922–26	6	12	3	4	4	—	—	—	—	—	29
1927–31	1	11	16	5	6	5	1	—	—	—	45
1932–36	1	10	17	7	6	2	—	1	1	1	46
1937–41	3	17	14	16	9	8	8	—	—	—	75
1942–46	—	6	5	10	5	8	3	3	1	—	41
Total for age of entry	18	62	65	45	30	23	12	4	2	1	262

of age. Table V shows, for the men entering each organization as unskilled workmen, the period during which they were taken on, and their ages at the time. Table VI gives a similar analysis of the men entering each organization as skilled workmen. From Table V it is seen that a high proportion of G.P.O. Engineers at present in their 30's were recruited as unskilled workmen during the slump period 1932–36. This was part of a Government policy to provide work for unemployed men. From Table VI it is seen that during the period 1937–41, the G.P.O. Engineering Department took on a high proportion of skilled workmen now in their 30's. During the period 1937–46 Messrs. ———, Ltd., took on a high proportion of unskilled workmen of all ages from 15 to over 60, a large proportion being boys under the age for military service.

III. THE TESTS USED.

The tests used were Progressive Matrices, 1938 (2), and the Mill Hill Vocabulary Scale, Form I (3). These two tests were constructed for use together in order to show in a distinct and clearly defined form (*a*) a person's present capacity for intellectual activity, and (*b*) the level of his present intellectual attainments relative to other people. Both tests had been standardized for children 6 to 14 years of age. The Matrices Test had also been standardized for men 20 to 25 years of age(4). The tests still needed to be standardized for older people.

Progressive Matrices (1938) is a non-verbal test of a person's capacity at the time of the test to form comparisons, reason by analogy, and develop a logical method of thinking regardless of previously acquired information.

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TABLE VII.—*Re-test Reliability and Inter-Correlation of Progressive Matrices (1938), and the Mill Hill Vocabulary Scale, at Different Ages.*

Age range.	Number tested.	Matrices Test. First test. Mean score.	Matrices Test. First test.	Matrices Test. Re-test reliability.	Vocabulary Test. First test. Mean score.	Vocabulary Test. First test.	Vocabulary Test. Re-test reliability.	Correlation between P.M. and M.H.V. scores.
Under 30	44	48	8·2	·93	41	15·7	·97	·60
30–40	104	37	9·5	·88	33	8·9	·91	·51
40–50	106	35	11·2	·87	31	9·0	·98	·45
50 and over	77	29	10·5	·83	31	12·1	·90	·44

In other words, it is a test of a person's capacity to understand and apply a fresh method of thinking. It is in no sense a test of any specific ability or aptitude, but it has repeatedly proved to be a valuable test of a person's normal capacity to learn any particular knowledge or technical skill he may desire to acquire.

The Mill Hill Vocabulary Scale is a test of the general fund of information a person has acquired as the result of intellectual activity in the past. It does not indicate what a person will in future be able to learn, but it provides one of the most satisfactory means of determining the best level of intellectual development a person has attained in the past, whatever his present capacity for intellectual activity may happen to be.

IV. RE-TEST RELIABILITY AND INTER-CORRELATION OF THE TESTS.

During 1943 the two tests were given in their standard form without a time limit to 331 men of the Civil Defence Light Rescue Squads in North London. The men were re-tested a month later. Table VII summarizes the results. According to both tests, the men under 30 years of age are, as a group, more able than the rest. (The group contained a number of conscientious objectors.) For the men over 30 years of age, the mean Vocabulary Test score remains relatively constant. The mean Matrices score, on the other hand, declines noticeably. The Matrices re-test reliability is seen to decline also. One possibility is that low scores on the test are in themselves less reliable than high scores. It should, however, be noticed that the Vocabulary Test reliability also declines as age advances. Another possibility is that as a result of asking a person to choose right answers out of groups of alternatives, the lower his genuine score the greater the number of opportunities he has of choosing the right answers by chance alone. The same decline in reliability, however occurs when the definition half of the Vocabulary Test is considered by itself. Clinical work with the tests suggests that low re-test reliability and inter-correlation represent a genuine variability in the output of intellectual activity under certain conditions. Both tests show the highest re-test reliability and inter-correlation when they are given to healthy people 12 to 30 years of age. The lower re-test reliability and inter-correlation obtained when they are given to little children, old people, mental defectives, and people who are mentally ill, is probably due in part to chance factors, but more to a greater variability in the intellectual activities of such people. Whatever the explanation may be, it is clear that a distinction must be made between the results of unreliable tests and the test results of unreliable people.

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More accurate information concerning re-test reliability at different ages and the degree to which it represents genuine variability of mental output is urgently needed. This information could only be obtained from an investigation planned for the purpose. In the present investigation, to secure the co-operation of men of all ages, it was necessary to let those co-operating remain anonymous if they wished. As a result, it was not possible to re-test the men and investigate the psychological significance of differences between the first and second test results.

V. Variations in the Test Scores with Age.

The selected men who agreed to do the tests attended at stated times, and were tested in groups of about 25 to 30. The tests were carried out between 9 a.m. and 4.30 pm., and were administered according to the standard procedure. No time limits were imposed. The times of beginning and ending each test were noted, and a quarter of an hour between each group was allowed, to minimize disturbances. The trends in the test results for the men entering each organization as boys, as unskilled and as skilled workmen were sufficiently alike to warrant combining the three groups in order to determine the general changes in the test scores with age.

In Graph I, changes in the Matrices Test scores between the ages of 17 and 60, for 1,047 G.P.O. Engineers, are compared with changes in the test scores for 920 male employees of Messrs. ———, Ltd. The 5th and 95th percentile curves indicate, for each organization, the neighbourhood of the upper and lower extremes of the score distributions. The 25th and 75th percentile curves indicate the extremes between which lie the scores obtained by 50 per cent., or the main body of the men. The 50th percentile curve indicates the median or central score for each group. With one or two exceptions the percentile curves for the two organizations show a surprising similarity. The 5th and 95th percentile curves are susceptible to chance variations in the groups considered. For the employees of Messrs. ———, Ltd., the 25th, 50th, and 75th percentile curves show a marked downward trend in the scores obtained by men under 25 years of age, but it has already been noted that during the past ten years they have been taking on an unusually large number of unskilled youths. Recently they have in fact been compelled to employ almost any boy who applied to them for work.

For G.P.O. Engineers in their 30's there is an accentuated decline in the average Matrices Test score. For the employees of Messrs. ———, Ltd., the exact opposite occurs. It has already been noticed that during the slump period, the G.P.O. Engineering Department intentionally took on a large number of young, unskilled workmen, who are now in their 30's. During this period Messrs. ———, Ltd., were able to select the best men from a large number of applicants. In the neighbourhood of 60 years there are less consistent variations in the percentile curves. This is probably due to the fact that the numbers of men tested were small. Apart from this, most of the fluctuations in the percentile curves for one organization are offset by opposite fluctuations in the percentile curves for the other organization. In

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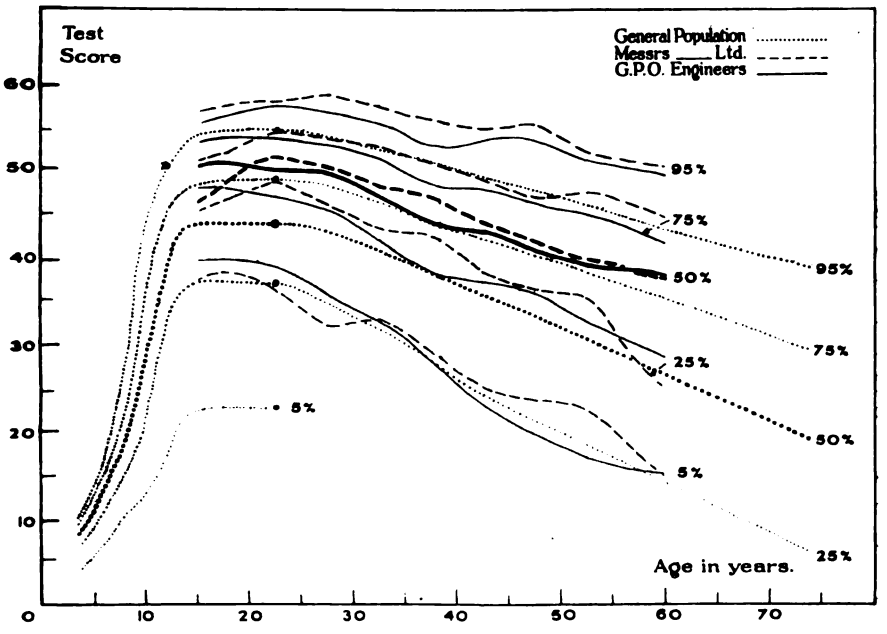
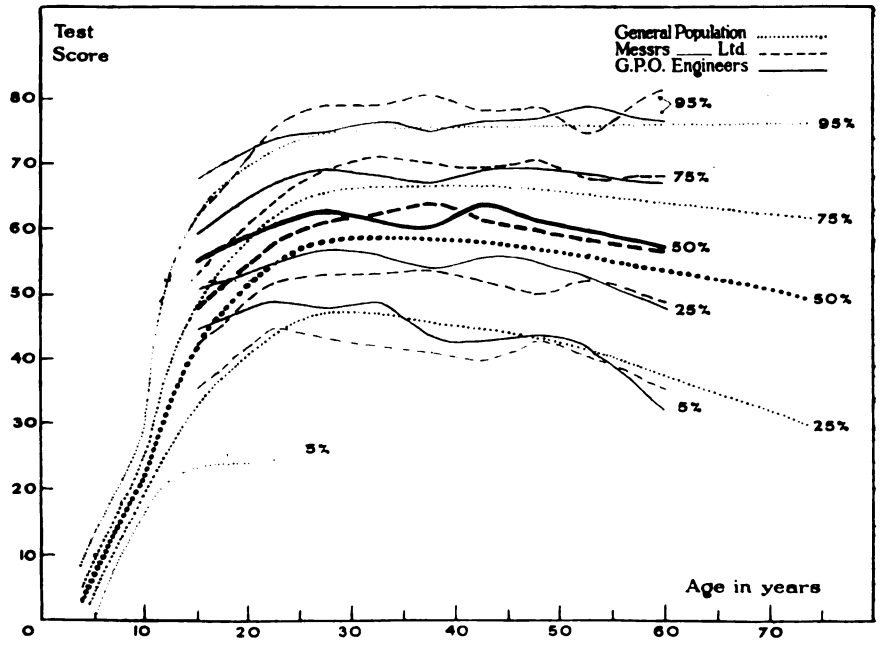


GRAPH I.—Variations in the progressive matrices test score.



GRAPH II.—Variations in the Mill Hill Vocabulary test score with age.

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general, the rate of decline in the Matrices Test scores from the age of 25 onwards is seen to be surprisingly uniform, and to be independent of the particular kind of work in which the men are engaged, or the conditions of employment.

The Progressive Matrices had already been standardized for men 20 to 25 years of age (4). In order to standardize the test for adults over 25 years of age, it was therefore possible to start with the established percentile points for men 20 to 25 years of age, and exterpolate each in accordance with the observed mean rate of change at that score level at successive intervals of five years. As the large majority of the men in the two organizations proved to be of average, or more than average ability, the normal 95th to 50th percentile curves could in this way be established with considerable accuracy. With slightly less accuracy it was also possible to exterpolate the normal 25th percentile curve. The investigation, however, provided insufficient information for it to be possible to determine changes in the 5th percentile score after the age of 25. The dotted curves indicate the established Matrices percentile points for children, and for men 20 to 25 years of age. They also indicate what are inferred to be the normal changes between the ages of 25 to 60, and after this, if we assume that the changes continue uniformly.

Graph II shows, for each organization, variations in the Vocabulary Test score with age. Compared with the G.P.O. Engineers, the percentile curves for the employees of Messrs. ———, Ltd., show the same steep downward trend for men under 25 years of age, due to the fact that at the present time they have to take almost any boy who applies to them for work. They al show the same peak in the 30's compared with a drop in the scores for the Engineers, due to the fact that during the period 1932–36 the G.P.O. tool on a large number of young, unskilled men, while Messrs. ———, Ltd., could select their staff from a large number of applicants. According to the median Vocabulary Test scores, the Engineers appear, as a group, just slightly more able than the employees of Messrs. ———, Ltd. According to the Matrices Test scores, they appear, as a group, just slightly the reverse. The difference may reflect a greater thoroughness of education in Scotland, or fewer outdoor leisure interests. Unlike the Matrices Test, the Vocabulary Test percentile curves show, for both organizations, a consistent rise in the scores up to about the age of 30. After this they remain practically constant up to the age of 60.

For the Vocabulary Test, the normal dispersion of scores for men between 20 and 25 years of age was not already known. In order to fix the chief percentile points at maturity, a pool was therefore made of all the available test records for normally healthy men 17 to 30 years of age, obtained in this and other investigations. To this was added a group of test records for men of similar ages, but known to be definitely below the average in intellectual ability. From this pool records were drawn until at the average age of 20 and 25, two populations were built up in such a way that for each age group the Matrices Test scores were distributed in agreement with the distribution obtained from Militiamen in 1941 (4). The Vocabulary Test scores for each population were subsequently used to compute the normal percentile distribution at 20 and at 25. The chief percentile points obtained for men age 20 $\pm$ 3 years, and men aged 25 $\pm$ 5 years, are shown in Table VIII. Unlike

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TABLE VIII.—*Mill Hill Vocabulary Scale Percentile Points Calculated for a Normalized Sample of* 156 *Men* 20 ± 3 *years, and* 268 *Men* 25 ± 5 *years.*

Percentile points.	Average age.	
	20.	25
95	71	74
90	65	72
75	59	66
50	**51**	**58**
25	39	48
10	27	33
5	22	26

the scores obtained with the Matrices Test, there is a noticeable increase in the Vocabulary Test scores after the age of 20. The increase is relatively uniform throughout the distribution, and suggests that the normalized samples used are moderately consistent. With the normal Vocabulary Test percentile points at least tentatively established for men 20 to 25 years of age, it was possible to exterpolate the 25th to 95th percentile points up to the age of 60, in the same way as it was possible to exterpolate them for the Matrices Test scores.

VI. Inferences Concerning Normal Changes in Mental Ability with Age.

According to Graph I, the capacity to form comparisons and reason by analogy increases rapidly during childhood, appears to reach its maximum somewhere about the age of 14, after which it remains relatively constant until from about the age of 25 onwards it slowly declines. If the decline continues at a similar rate after the age of 60, it would appear that by the age of about 80, the average person's capacity to grasp fresh ideas and adopt new methods of working has ceased to be greater than that of a child of eight. This is important in view of the fact that before the age of 8 years the average child is incapable of forming abstract comparisons and reasoning by analogy, at least as a systematic method of learning. According to Graph I this would appear to apply equally well to old people. This is interesting as, in work carried out with seniles (5), it has already been found that old people can only understand the test at all if it is given to them in the form of boards and moveable pieces, just as one would give the test to a little child, and that when it is given to them in this form, it is one of the very few tests which they can understand and carry out at all effectively.

According to Graph II, the average person's ability to recall information normally increases up to the age of at least 25, and from about the age of 30 onwards remains relatively constant for about 25 years, after which it apparently declines a little. For people above the average, ability to recall information apparently continues to increase slowly even up to the age of 60. For people below the average the opposite appears to be the case. What ability they acquire in youth appears to decline fairly early in life.

With minor exceptions, the findings are in agreement with the findings of other investigators (6, 7, 8, 9). They are also in agreement with the generally

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accepted view that from about the age of 30 onwards a person's ability to understand new methods of thinking, adopt new methods of working, and even to adjust to new situations, steadily decreases, whereas he is normally able to recall acquired information long after his capacity to adapt to new situations has begun to decline. The findings also support the view that a Vocabulary Test gives an index of the best level to which an individual has attained, whatever his present capacity for intellectual activity may be (10).

We still need more accurate information concerning normal changes with age occurring amongst people definitely below the average in intellectual capacity, and more representative groups of test records for people 15 to 30 years of age. Information is also needed concerning the normal changes after the age of 60. At present there is inadequate information concerning changes in the re-test reliability with age, and the degree to which they indicate increased variability of mental output as distinct from the unreliability of the test score in itself. Investigations so far completed, however, provide us with considerable information concerning normal changes in the test scores of adults of average, or more than average, intellectual capacity, and it is anticipated that subsequent investigations will fill at least some of the gaps in our present knowledge.

ACKNOWLEDGMENTS.

Thanks are due to Dr. P. K. McCowan and the Directors of The Crichton Royal for making the necessary Research Staff available; to the Regional Director and Officials of the Post Office in Scotland, and to the Directors and Staff of Messrs. ———, Ltd., London, for providing the necessary information and facilities for the investigation. Thanks are also due to the men in each organization who volunteered to do the tests. It is only as a result of such joint co-operation that an investigation of this kind is possible. Comparable data drawn from different branches of industry, and from the fields of Education, Health and Public Administration, is vital to basic psychological research, and to co-operative social welfare. It is hoped that the present comparative study will be the first of others equally gratifying to report.

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THE PLACE OF PSYCHIATRY IN MEDICINE.*

By NOEL HARRIS, M.D., F.R.C.P.

I WISH to make it clear at once that for the purpose of this paper I am taking the definition of psychiatry as being synonymous with the term psychological medicine—in other words, the study of the subject as a whole.

The place of psychiatry in general medicine can be considered from two angles: (1) In what way can the health of the individual patient be improved both prophylactically and therapeutically by a greater understanding of that individual's psychological make-up, and (2) whether there are any specific factors which have arisen or are likely to arise from a knowledge of psychiatry which increases our knowledge of the aetiology and pathology of general disease?

I am going to deal with the first point comparatively briefly, not because I do not feel strongly about the importance of it, but because I want to concentrate this morning on the second aspect.

Nearly everyone agrees that the study of the individual is important, but it is extraordinary how many people fail to put it into practice.

In any organic illness the patient's individual emotional reaction to that illness does affect his total state of health, and this should be considered. Broadly speaking the more synthesized a person's character, the more is he able to "cope" with or adjust himself to any organic illness which he may develop. The greater the neuropathic tendencies in an individual, the more is he or she likely to make a fuss and poor adjustment to his physical illness, but surely that is no excuse for a doctor getting impatient with or critical of a patient. The doctor's duty is to cure the patient as a whole, and therefore if, instead of regarding the patient who is difficult in his reaction to the illness as another "headache," he regards the attitude of the patient as a complication of or sort of secondary illness to be diagnosed and treated just as the primary physical illness, then that unfortunate element of friction that may arise between doctor and patient will rarely do so, and I believe the doctor will find a greater interest rather than irritation in that individual patient. Moreover, everyone of us should try to remember that our attitude towards functional illness is often not a rational objective, but a projection of our own emotional disturbance. So often when dealing with psychological disorders we feel ignorant of the real facts, and certainly ignorant of how to cure the patient's troubles, therefore we feel frustrated and project that sense of frustration on the patient.

I well remember an occasion at home when I was criticizing some of the tests which were being used in a certain section of the Army at that time,

* A paper read at the Discussion on the Place of Psychiatry in Medicine at the Annual Meeting of the Royal Medico-Psychological Association at Eastbourne, 12 July, 1947.

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until it was pointed out to me that the tests I was criticizing most hotly were the tests I could not do myself.

Another point to remember is that sometimes we do patients harm by ordering repeated physical examinations and investigations in a manner that suggests we almost want to avoid making a diagnosis of nervous disorder. It was a real pleasure to hear in the Presidential Address the need for education mentioned. It is of infinite importance, not only for the medical profession but also the public, to realize how our emotional life does affect our physical state.

Of course I realize how trying the neurotic patient can be, and there is nothing more important than a balanced view-point and sense of humour in considering these matters. It is a fact, however, that if one learns to regard a patient's querulous or trying behaviour as a symptom in themselves, something which can be explained and often put right, one's own sense of annoyance at the patient's behaviour is lessened in the interest of finding out why the patient behaves in such a manner. The only way to stimulate medical men's interest in the problem is to start teaching them normal psychology, to give them a realization that a great deal can be learnt as to why people do feel and act in any particular manner. There are few more fascinating studies than human behaviour when once the subject is broached.

The study of the patient as an individual leads on to the study of the patient *en masse*, and, without in any way detracting from the importance of the splendid work that has been done in public health, I would suggest that psychiatry has made and is making the main contribution in the progress of social medicine to-day, and this is clearly a part of general medicine. The increasing importance of all those matters which are included under the term "social medicine" have been brought to the surface and stressed very largely through the increasing influence and knowledge of psychological factors.

Consider also health in industry. Statistics show that a very high percentage of hours lost through sickness in industry result from so-called functional illness rather than pure physical illness. Comparatively scant attention has been given to this matter until recently. The old diagnoses of nervous debility, neurasthenia or nervous dyspepsia were allowed to go unchallenged. It is largely through an increasing knowledge of psychiatry applied to medicine that the importance of studying the conditions under which people work, the suitability of persons for a particular job, personnel selection and many other factors have been brought to the fore. Another point that should be mentioned which is of great prophylactic importance is what I will term broadly marital hygiene. The amount of unhappiness, and at any rate minor, if not major, ill-health which results from marital disharmony is hardly realized, but statistics so far as they go would point to it being very high, and many gynaecologists and general practitioners must be faced with this fact. In this realm it is psychiatry again that has led to an appreciation of the need for more study and treatment. I hope that I have said enough to prove my first point, though much more could be said.

We now come to what specific contribution psychiatry has made to our understanding of the aetiology and pathology of disease.

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The diagnostic label "nerves" or "nervous" has been attached to many conditions by all members of the profession, often unfortunately with an indication of slight scorn, and also more unfortunately in such a way as to give the patient the impression that the term means some physical disturbance of material nerve structure. Many a patient who has been told that he has nervous dyspepsia gets a sort of mind picture of the nerves supplying the stomach wall being like red-hot wires—something physical—and it cannot be emphasized too strongly that all the evidence goes to show that it is a disturbance of the *emotional* life of the person which is causing the illness.

Many workers have already drawn attention to the importance of emotional disturbance in certain well-recognized physical illnesses, for instance, gastric and duodenal ulcers, Graves' disease, colitis, and more recently in certain skin diseases and diseases of muscles and joints. It is accepted by all that emotional disturbance does produce a physical reaction. The effects of fear in producing tachycardia, tremors and sweating are common to all.

The whole realm of psycho-somatic medicine is beginning to come into the field of general medicine, and it is perhaps in this particular sphere that psychiatry can make its greatest contribution.

On going through the literature, it is clear that a high percentage of medical men realize the importance of emotional factors in causing gastric and duodenal ulcers. Harvey Cushing made this clear in a paper published in 1932.* There is still much argument as to the details of how the ulcer is produced, and it is probable that there is some constitutional factor in the individual which predisposes him to ulcers, but, even so, if that person can be kept free from a state of emotional tension, there is every likelihood that an ulcer will not develop. Moreover, it is worthy of consideration whether the constitutional factor which predisposes him to ulcer formation may not be similar in some way to the constitutional factor which possibly predisposes him to emotional tension, for there seems to be a group of people who generate anxiety in themselves as a dynamo generates electricity, and even much psychotherapy and insight fails to stop them generating this anxiety.

Increasing attention has been paid to emotional factors in the production of muscular and joint disturbances. Flind and Barber† describe a number of service patients who were seen on account of pain and symptoms which might be placed in that loosely used diagnostic category of "chronic rheumatism or fibrositis." They considered that the most important fact in all these patients was the psychogenic one. On the other hand, Kelly,‡ in an article in *Rheumatism*, disputes some of these interpretations, and points out that while he is sympathetic to the psychogenic factor, there may be subtle physical factors not yet clearly understood causing the symptoms.

In a paper read before the last Annual Meeting of the Chartered Society of Physiotherapists and published in their journal§ I pointed out how emotional tension frequently leads to muscular tension, and that this may well make a muscle more prone to develop secondary physical disease quite apart from the

* *Surg. Gynaec. and Obst.*, **55**, 1, 1932.
† S. Flind and H. S. Barber, *Quart. J. Med.*, **14**, 57, 1945.
‡ Michael Kelly, *Rheumatism*, **3**, No. 3, 1946.
§ *J. Chartered Society of Physiotherapists*, January, 1947.

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various symptoms which occur purely as a result of prolonged muscular tension. Since this paper a number of physiotherapists have told me of the increased number of patients they have had during the war in whom emotional factors seemed far more important than damp air-raid shelters and other physical factors.

It would be possible to give many other examples ranging over genito-urinary disease, cardiology and endocrinology, but there is not the time. Many interesting facts are related in Weiss and English's admirable book, *Psychosomatic Medicine*.

It can hardly be disputed, however, that an understanding of the mechanism by which emotional tension affects the physical state would advance our knowledge of both the aetiology and pathology of many disease processes, and would probably lead to a minor revolution in some forms of treatment. Research work in this is all important, and if successful would do more than anything else to show the place of psychiatry in general medicine.

During the war we were fortunate enough at Woodside Hospital, which is now amalgamated with the Middlesex Hospital, to have a case of extreme interest, and I believe of paramount importance. This case has been recorded by my colleague, Dr. Robert Moody.* In case there are some who have not seen the article, I will relate briefly the more important points. An officer, aged 35, who had been a regular soldier, but who had been invalided out for somnambulism before the 1939 war, was admitted because of this symptom of somnambulism, which started to interfere with his work after he had been re-called to the Colours in 1939. He was treated by so-called " narco-analysis," pentothal mostly being used.

On one occasion after an abreaction, during which he re-lived an incident which occurred more than ten years prior to the time of treatment, an incident in which his forearms had been tightly bound together, he developed on his forearms the complete marks caused by the ropes which had bound him. There was the sulcus where the ropes had " bitten in," with even the criss-cross of the strands and the slightly raised oedematous edge. This phenomenon seemed unbelievable at first, but fortunately for scientific purposes all the emotion attached to the incident was not exhausted, and the abreaction was repeated twice under test conditions and the marks photographed.

This stimulated our interest, and since then Moody has had other similar results with other patients. Edkins in a yet unpublished paper has described his use of different reagents in abreactive technique, his results leading him to think in terms of different " levels of reaction," which might well fit in with some of the basic teachings of Hughlings Jackson.

The interpretation of these results we hardly venture to attempt at present, though it is hoped to carry out further research in an attempt to explain these and similar phenomena at the Middlesex Hospital. It is certain, however, that these phenomena do occur, and that full understanding of them will surely mean that a real contribution has been made to general medicine.

These phenomena suggest that a psycho-somatic pattern, if I can coin such a phrase, is absorbed into some part of the total individual—I purposely avoid

* R. L. Moody, *Lancet*, 28 December, 1946, p. 934.

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using the term unconscious. If the emotional part of the pattern is reproduced with partial or complete intellectual conscious recall of the original experience, then the physical structure of the body may be activated in such a way as to show all the signs of a trauma previously experienced. This leads to speculation as to whether certain physical manifestations, such as an ulcer, or some particular skin lesion, or mono-symptomatic pain, such as is seen in the facial area—the unsuccessfully treated cases of what was thought to be trigeminal neuralgia—may be the visible, somatic sign of some psycho-somatic pattern, the emotional part of which is still hidden away. If so, by what means can the emotional part of the pattern be located and released, and if this is done, will it cure the physical disturbance? Again, is there some middle course which can be adopted? The various means of dealing with autonomic imbalance at once come to mind, but few of these methods of treatment seem very satisfactory up to the present.

There are one or two observations which may stimulate interest and research in others which I would like to make. Why is it that in an anxiety state, particularly an acute attack, certain parts of the autonomic seem to be picked out in different people? Why does one person get tachycardia, sweating and tremors and no dyspeptic symptoms, while another person will get dyspeptic symptoms and no tachycardia?

Why is it that during abreaction certain people will get a recurrence of the actual signs of a physical injury which occurred during an incident long prior to treatment, while others will have an equally good emotional outburst yet develop no such physical signs? I think there is some evidence to suggest that those people who may develop such physical signs are people who dissociate comparatively easily. Now on what does dissociation depend? I am not at all sure that it is not a constitutional factor which determines whether a person dissociates easily or not, and if it is, then here again is a further approach into the realm of general medicine.

The explanation of these phenomena seems to lie in the intimate interrelationship of the autonomic nervous system with that part of our body which deals with emotional reaction, but research alone will elucidate these facts.

In conclusion, I would maintain that no longer should psychological medicine be considered a subject apart from general medicine. It is not that psychiatrists wish to enlarge their own speciality; far from it. Much which is dealt with in the realm of psychological medicine should be taken over into the realm of general medicine, thus in a way making our own speciality a smaller matter to deal with.

Normal psychology should be taught as an essential approach to the understanding of health and disease. General physicians and surgeons knowing their normal psychology should deal with a lot of the cases which now may get turned over to an already overcrowded psychiatric out-patients' department. Perhaps most important of all, research work with a team of workers, working in harmony and co-operation, should push ahead with the blending of this whole matter, and the work should be carried out not only in the mental hospitals, but in general hospitals as well, for it is part—an essential part—of general medicine.

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Part II.—Review.

Handbook of Correctional Psychology. Edited by ROBERT M. LINDER, Ph.D., and ROBERT V. SELIGER, M.D. New York: Philosophical Library. Pp. 691. Price $10.00

Forty-six authors—psychiatrists, neurologists, psychotherapists, surgeons and public health officials—contribute the forty-seven articles in this book. It is intended as a guide for prison physicians, psychiatrists, social workers, administrators and custodians in correctional work, and to indicate the way to improved measures of rehabilitation in detention and custodial institutions. The approach is essentially practical, but theoretical points of view receive consideration. Since the book endeavours to interest readers whose knowledge and training varies, it is almost inevitable that some of the articles will appear elementary to psychiatrists and prison physicians, whilst others dealing with, say, the use of electroencephalography in penal practice, or that on sugar metabolism in relation to criminology, may be outside the concern of those without medical experience.

A few articles deal almost exclusively with matters of general medical or surgical interest, and the inclusion of an account of a venereal disease programme in prison is unexpected in a book on correctional psychology.

Here and there over-elaboration is apparent, and occasionally over-simplification. But the articles are generally well balanced, lucidly expressed, and easy to read. Many are written by psychiatrists and others whose names are well known and respected in Great Britain. A useful bibliography is appended to many with advantage.

Considered as a summary of current American opinion, the book is assured of a place on the shelves of those who wish to obtain a closer understanding of the law-breaker and the medical methods which may assist in his rehabilitation.

W. NORWOOD EAST.

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Part III.—Bibliography and Epitome.*

AN attempt is being made to provide as far as possible a complete bibliography compiled from journals dealing with Psychiatry and Neurology (which are really inseparable) and their ancillary subjects, psychology, anatomy of the nervous system, criminology, etc.

If any reader can add the names of journals to the following list, which it is hoped to publish each year in the January number, the addition will be gratefully received and acknowledged.

Those journals which are available in the Library of the Royal Medico-Psychological Association are marked " 1," those available in the Library of the Royal Society of Medicine are marked " 2," those in the Library of the British Psychological Society are marked " 3," and those in the Library of the British Medical Association are marked " 4."

The titles of these journals are mostly in the form given by the Board of Editors of Publications of the American Psychological Association, January, 1939. Contributors are requested to use the exact form given below.

PSYCHIATRIC JOURNALS.

2 *Abh. Neur. Psychiat.*
Abh. Psychother.
2 *Acta Española Neur. y Psiquiat.*
Acta Neurol., Naples.
2, 3, 4 *Acta Psychiat. et Neurol., Copenhagen.*
3 *Acta Psychol., Hague.*
Acta Psychol., Keijo.
Alg. Neder. Tijdschr. Wijsbegeert. Psychol.
Aliéniste Français.
2 *Allg. Ztschr. f. Psychiat.*
Altersprobleme.
Am. Imago.
1, 2 *Am. J. ment. Def.*
1, 2, 3 *Am. J. Orthopsychiat.*
1, 2, 3, 4 *Am. J. Psychiat.*
2, 3 *Am. J. Psychol.*
Am. J. Psychotherap.
Am. Psychol.
An. Bras. Hig. Ment.
An. Istit. Psicol. Univ. B. Aires.
An. Psicotec., Rosario.
Anal. Inst. Neurol., Montevideo.
Analele Psihol. (Rumania).
Anales de psicol., Buenos A.
2, 3 *Année Psychol., Paris.*
2, 3 *Ann. Méd.-Psychol.*
2 *Ann. Osp. psichiatr., Perugia.*
Appl. Psychol. Monogr., Washington.
Arb. Psychiat. Inst., Sendai.

* A number of extracts in this section are reproduced from *Chemical Abstracts* and *Psychological Abstracts*. To the Editors of these two Journals we extend our grateful thanks.

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Arch. Anthrop. crim.
2 *Arch. Argent. de Neurol.*
Arch. Argent. Psicol. norm. pat.
2 *Arch. Bras. de Neur. e Psiquiat.*
Arch. Brasil Hig. Ment.
Arch. Chilenos de Crim.
Arch. Ital. di Studi Neuropsich.
1, 2 *Arch. Neurobiol.*
Arch. Neurocir., Paraguay.
4 *Arch. Neurol., Paris.*
2 *Arch. de Neurol. de Bucarest.*
1 *Arch. de Neurol.*
2 *Arch. di Antropol. Crim.*
Arch. di Crim. Neuropsiquiat. y Disc. Con., Quito.
Arch. di Sci. Cereb. Psich., Salerno.
2, 4 *Arch. f. Psychiat.*
2, 3 *Arch. ges. Psychol.*
Arch. Internat. de Neurol.
Arch. Ital. Psicol.
Arch. Krim. Anthrop.
1, 2, 3, 4 *Arch. Neurol. Psychiat., Chicago.*
Arch. Neur. Psychiat., Mex.
2, 3 *Arch. Psicol., Neurol., Psichiat. e. Psicoter., Milan.*
2, 3 *Arch. Psychol., Genève.*
2, 3 *Arch. Psychol., N.Y.* (ceased publication 1945).
Arch. Relig. psychol.
Arch. Speech.
Arq. da Assist. a Psicop. de Pernambuco.
Arq. de Neuro-psiquiat., Brasil.
3 *Austr. J. Psychol. Phil., Sydney.*

Beih. Z. angew. Psychol.
Beih. Zbl. Psychother.
Bol. Inst. Psiquiat., Rosario.
2, 3, 4 *Brain.*
3 *Brit. J. Educ. Psychol.*
2, 4 *Brit. J. Inebriety* (now *Brit. J. Addiction*).
1, 2, 3, 4 *Brit. J. Med. Psychol.*
2, 3, 4 *Brit. J. Psychol.*
2, 3 *Brit. J. Psychol. Monogr. Suppl.*
Bull. Canad. Psychol. Ass.
2, 4 *Bull. de la Soc. de Psychiat. de Bucarest.*
2 *Bull. de la Soc. Roumaine Neur. Psychiat. Psychol. Endocrin.*
Bull. du Group. Franç. d'étud. de neuro-psychopath. infant.
2 *Bull. industr. Psychol., Melbourne.*
2 *Bull. Los Angeles Neur. Soc.*
2 *Bull. Menninger Clin.*
Bull. Milit. Clin. Psychol.
Bull. Soc. Psihol. med., Sibiu.

Canad. Journ. Occup. Ther.
Canad. J. Psychol., Toronto.
2, 3 *Cath. Univ. of Amer. Studies in Psychol. and Psychiat.*
2 *Cervello.*
2, 3 *Character and Per.* (now *J. Personality*).
2 *Child Develpm.*
2 *Child Develpm. Abstr.*
Child Develpm. Monogr.
Child Study.
Chin. J. Educ. Psychol., Chungking.
Chin. J. Psychol.
3 *Comp. Psychol. Monogr.*

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2 *Confinia Neurol.*
Contr. del Lab. di Psichol.
Contr. Lab. Psicol., Milan.
Contr. psychol. Theor.
Criança Portuguesa.
Criminalia, Mexico.

2 *Deutsche Ztschr. f. Nervenh.*
2 *Dis. Nerv. Syst.*

3 *Educ. psychol. Measmt., Washington.*
Egypt. J. Psychol., Cairo.
1, 2, 3, 4 *L'Encéphale.*
2 *Epilepsia.*
Evolut. Psychiat.

Fiziol. Th. S.S.S.R.
2 *Folia Neuropath. Esthon.*
2 *Folia Psychiat. et Neurol. Jap.*
2 *Fortsch. Neur. Psychiat.*

3 *Genet. Psychol. Monogr.*
Geriat., Minneapolis.
Giorn. di Psich. e di Neuropat.

Hum. Factor.
Hum. Relat., Cambridge, Mass.
2, 3, 4 *Hyg. Ment.*

Illinois Psychiat. J.
2 *Index Neurol. y Psiquiat., Buenos Aires.*
3 *Indian J. Psychol., Calcutta.*
Indiv. Psychol. Bull., Chicago
3 *Industr. Psychol.*
3 *Industr. Psychotech.*
1, 2, 3, 4 *Int. J. Psychoanal., London.*
2, 3 *Int. Z. Psychoanal. u. Imago.*

Jap. J. appl. Psychol.
Jap. J. Exp. Psychol.
Jap. J. Psychol.
1, 2, 3 *J. Abnorm. Soc. Psychol., Washington.*
J. Am. Soc. Psychic. Res.
3 *J. App. Psychol., Washington.*
2, 4 *J. Belge Neur. Psychiat.*
J. Child. Psychiat.
J. Clin. Psychol., Burlington.
2 *J. Clin. Psychopath., Montecello, N.Y.*
2 *J. Comp. Neur.*
1, 2, 3 *J. Comp. Psychol., Washington.*
J. Consult. Psychol., Washington.
J. Crim. Law and Criminol., Chicago.
2 *J. Crim. Psychopathol.* [now *J. Clin. Psychopath.*].
2 *J. de Psychiat. Infant* [now *Zeit. f. Kinderpsychiatrie*].
3 *J. Educ. Psychol., Baltimore.*
J. Except. Child.
3, 4 *J. Exp. Psychol., Washington.*
2 *J. f. Psychol. u. Neurol.*
3 *J. Gen. Psychol., Provincetown, Mass.*
2, 3 *J. Genet. Psychol., Provincetown, Mass.*
2 *J. Geront., St. Louis.*
J. Juvenile Res.

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1, 2, 3, 4 *J. Ment. Sci., London.*
1, 2, 3 *J. Nerv. Ment. Dis., New York.*
1, 2, 3, 4 *J. Neurol. Neurosurg. Psychiat., London.*
J. Neuropath. and Psychiat., Leningrad.
1, 2 *J. Neuropath. Ex. Path.*
2, 4 *J. Neurophysiol.*
J. Neuropsychiat. du Pacifique.
2 *J. Neurosurg.*
3 *J. Parapsychol., Durham, D.C.*
2 *J. Personality, Durham, D.C.*
J. of Psychic. Res.
J. Psihoteh.
2 *J. Psycho-Asthen.* [now *Amer. J. Ment. Deficiency*].
1, 2, 3 *J. Psychol.*
J. Psychol., Moscou.
2, 3 *J. Psychol. Neurol., Leipzig.*
2 *J. Psychol. Norm. Path., Paris.*
J. Soc. for Psychic. Res.
3 *J. Soc. Psychol., Provincetown, Mass.*
2 *J. Speech Dis., Danville, Ill.*

Kriminal.
3 *Kwart. Psychol.*

Mag. psychol. Szle.
2 *Ment. Health, London.*
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Mschr. Krim. Biol.
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2 *Neopsichiat.*
2 *Nervenarzt.*
Nerv Child, New York.
3 *Neue psychol. Stud.*
2 *Neurbiol., Pernambuco.*
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2 *Note e Riv. di Psichiat.*
Now. Psychjar.
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2, 3 *Occup. Psychol., London.*
2 *Occup. Ther. and Rehabil.*
2 *Onder. Psychiat-Neur. Klin., Utrecht.*
2 *Osped. Psichiat.*

3 *Person. J.*
Pisani.
Polsk. Arch. Psychol.
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Prog. Neurol., Psychiat.

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3 *Psichotec.*
Psicoanalisi, Rome.
Psicoter., Cordoba.
Psyche, Cambs., Mass.
Psychiat. Monogr.
2 *Psychiat. en Neurol. Bl., Utrecht.*
2 *Psychiat. et Neurol. Jap.*
2 *Psychiat. Neurol. Wchnschr.*
2 *Psychiat., Washington.*
1, 2 *Psychiat. Quart., Utica, N.Y.*
2, 3 *Psychoanal. Quart., Albany, N.Y.*
2, 3 *Psychoanal Rev., New York.*
1, 2, 3 *Psychol. Abstr., Washington.*
1, 2, 3 *Psychol. Bull., Washington.*
Psychol. Clin.
Psychol. Exch.
3 *Psychol. Forsch.*
Psychol. Index.
2 *Psychol. Monogr., Washington.*
Psychol. Rec.
3, 4 *Psychol. Rev., Washington.*
3 *Psychol. Rev. Monogr.*
Psychol. Stud. Kbh.
Psychol. Stud. Univ. Bp.
Psychol. wychow.
3 *Psychomet., Chicago.*
Psychometr. Monogr.
2 *Psychosom. Med., New York.*
2 *Psychosom. Med. Monogr., New York.*

Quart. J. Speech.
2 *Quart. J. Stud. Alc., New Haven, Conn.*
2 *Quart. Rev. Psychiat. Neur., Washington.*

Rass. Neurol. Veget., Firenze.
Rass. Neuropsichiat. Sci. Aff., Salerno.
Rass. Studi Psichiat.
Rev. Argent. Neurol. Psiquiat.
Rev. de Psicoanal., Argentina.
Rev. di Neur. e Psychiat., S. Paolo.
Rev. di Psiquiat., Chile.
Rev. di Psiquiat. y Crim.
Rev. Espan. de Oto-neuro-oftam. y Neurocir.
3 *Rev. Franç. Psychoanal.*
Rev. Ibero-Amer. de Anal. Biblio. de Neurol. y Psiquiat.
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1, 2, 4 *Rev. Neurol.*
2 *Rev. Neurol. de Buenos-Aires.*
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2 *Rev. Neuro-Psiquiatr., Lima.*
2 *Rev. Oto-Neur.-Oftal. Cir. Neur. Sud-Am.*
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Rev. Psicol. Gen. y Aplic., Madrid.
Rev. Psicol. Pädag.
Rev. Psicoanal., B. Aires.
3 *Rev. Psihol.*
Rev. Psihol. Icor. Aplic., Sibiu.
2 *Rev. Psiquiat. Crim., B. Aires.*
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Rev. Psiquiat. y Disc. Con., Chile.
Rev. Psychol., Montreal.
Rev. Sudam. Psicol. Pedag.

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Rev. Tchèque de Neurol. et de Psychiat.
Ric. Psich.
2, 3, 4 *Riv. di Neurol.*
Riv. di Neuro-psiquiat., Peru.
3 *Riv. di Psichol.*
Riv. Ital. di Endocrin. e Neurochir.
2 *Riv. Patol. nerv. ment.*
Riv. Psichol. Norm. Pat., Ferrara.
2, 4 *Riv. Sper. Freniat.*
1 *Rocz. Psychjat.*
2 *Rorschach Res. Exch., New York.*

1 *Schizofrenie.*
2 *Schweiz. Arch. Neurol. Psychiat.*
Schweiz. Z. Psychol.
Schweiz. Z. Psychol. Anwend., Bern.
Skand. Arch. Psychol.
Sovet. nervropatol., psichiatri, psichogiuoguia.
Sovet. Psichoneurol.
Sovet. Psikhotekh.
Speech Monogr.

Tohoku Psychol. Folia.
2 *Tr. Am. Neurol. A.*
Tr. Beritov Inst., Tiflis.
Tr. Kostchenko Ment. Hosp., Moscow.
2 *Trud. fiziol. Lab. Pavlova.*
Trud. tsentral. psikhonevrol. Inst.

Univ. Calif. Publ. Psychol.
Univ. Iowa Stud. Psychol.
Untersuch. Psychol. Phil.

3 *Z. angew. Psychol.*
Z. Arb. Psychol.
Z. Berufs. des Pflegepers.
Z. Individ. Psychol.
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2 *Z. Kinderpsychiat., Basle.*
3 *Z. Pädag. Psychol.*
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3 *Z. psychoanal. pädag.*
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The Serial Sevens Test as a Psychometric Instrument.

By virtue of the frequency with which the Serial Sevens Test has recently been used as an instrument for the rapid screening of mental defectives, the present study has endeavoured to study the relationship between performances of 201 white and 77 negro adult males on the Bellevue-Wechsler (Verbal) Scale of Adult Intelligence (10) and the Continuous-Subtraction examination (7). These men

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ranged in age from 17 to 24 and revealed tested intelligence quotients ranging from 47 to 94. These two samplings, negroes and whites, were selected for study only after psychiatric examinations had revealed the existence of no marked neurological and personality disorders. On the basis of the results obtained here and those reported earlier by other investigators the following concluding statements are made:

(1) For all population samplings reported thus far a low positive coefficient of correlation exists between performance scores earned on a standardized test of general intelligence and the Serial Sevens Test. These coefficients are too low to possess predictive value. Alienation coefficients are above ·90 and suggest that the variables tested in the two sets of scales are relatively independent.

(2) The Serial Sevens Test, accordingly, cannot be used as an abbreviated psychometric examination in the rapid screening of mental defectives. Nor can it be used in the accurate quantification of levels of intelligence. The test does not appear to measure adequately whatever mental functions are tested by the Verbal Battery of the Bellevue-Wechsler Scale.

(3) An average (for 201 white males) success score of 4·0 on the Sevens Test could be earned by any white male aged from 17 to 24 years who has a Bellevue-Wechsler IQ ranging from 55 to 94. For negroes, as tested in this sampling, the IQ range is roughly the same with an average success score of 3·0.

(4) Patterned sequences (see text) are evidenced among the responses of those adjudged to be free from psychiatric disability. No pattern, however, is typical or diagnostic of the ament.

(5) Preliminary study of the optimal ways for the administration of the Sevens Test revealed the need for standardized procedure including especially the use of simple language in setting the task for the examinee.

(6) The present results coupled with those reported by previous investigators indicate that the Serial Sevens Test is restricted in its range of applicability. First, evidence presented by Sherman indicates that error scores do not tend to decrease until an IQ of 90 is reached among the 113 children studied. In the present study only 18 per cent. of those with intelligence quotients between 89 and 94 were able to solve the Sevens problem within a two-minute interval with a maximum of two errors. If the test is to be administered to adults, it would seem advisable only to do so when the intellectual status as quantified by an IQ of 100 or better (Bellevue-Wechsler Scale). Second, the Sevens Test can at best be given only to those of normal intelligence and to those whose educational qualifications (eight grade or better) are such as to insure their knowledge of basic arithmetic processes. If these two restrictions are admitted, then the evidence reported by Bronner *et al.* and Hayman indicate that the Sevens Test is of some value in the detection of psychological deficit.

(7) The wholesale administration of the Sevens Test to consecutive examinees in screening examinations is ill-advised and illustrates one misapplication of the scale. (Author's abstr.)

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The Effect of Anoxia as Measured by the Electroencephalogram and the Interaction Chronogram on Psychoneurotic Patients.

1. Observations on the effect of breathing low oxygen are reported in a series of 67 patients and 42 controls, in whom changes in central nervous system activity were measured by the EEG and changes in behaviour by the interaction chronogram.

2. Most subjects showed a shift in EEG to the slow frequencies during the low oxygen. This was more marked and consistent when the CO_2 was less than ·3 per cent. There was no difference between patients and controls.

3. A decrease in verbal and gestural activity was found in about three-fourths of the subjects. The decrease was greater for the patients than the controls.

4. Subjects with high initial activity while breathing air showed the greatest decrease as a result of low O_2. Subjects with low activity rates in air showed slight decreases and, in many cases, an increase.

5. Subjects with marked changes in EEG tended to show an increase in activity.

6. Four factors are discussed as playing a role in determining the changes in activity due to low O_2.

(*a*) Initial rate of activity.
(*b*) Diagnosis.
(*c*) Electroencephalographic changes.
(*d*) Autonomic activity as measured by heart rate.

(Authors' abstr.)

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Electroencephalographic Patterns from the Base of the Brain.

Electroencephalographic recordings from the base of the brain give valuable supplementary information to data obtained from conventional scalp recordings. Various locations of the deep lead are possible—subsphenoid, spheno-ethmoidal or subfrontal.

Several varieties of basal patterns are described and illustrated. The effect of visual stimulation, overbreathing, drugs, spontaneous and induced electrical discharges in epileptics, and of gross intracranial pathology is described.

In general the basal rhythm response to various stimuli is similar to that of the cortical (superficial) rhythm. Visual stimulation flattens the basal rhythm and blocks the alpha activity. Hyperventilation induces a build-up in size of potentials and a slowing of rhythm, which may be greater or less than that of the cortex. Autonomic drugs (epinephrine and mecholyl) appear to affect base more than cortex. Sodium amytal in amounts sufficient to produce intoxication but not sleep, results in high voltage fast waves in base as well as cortex.

Electrical paroxysms typical of epilepsy usually are more pronounced at the cortex than at the base.

The basal lead is a valuable adjunct in localization of gross intracranial pathology.

(Authors' abstr.)

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The Therapeutic Use of Prolonged Sodium Amytal Narcosis.

During the past eight years we have used prolonged sodium amytal narcosis in the treatment of border-line neuropsychiatric disorders. The therapeutic technique is usually so planned as to produce a toxic delirium after the cessation of drug administration. This therapeutic delirium is judged to be reliably restorative and reconstructive. Various degrees of narcoanalysis and narcosynthesis are permitted, but most benefit follows delirious abreaction. All patients to whom the treatment was administered were helped, some more than others. Dissolution of the faulty personality behavior and constructive recasting of the psychiatric problem probably occur through improved physiological rest and a remobilization of thought processes during an irresponsible and impersonal state of psychomotor activity which is temporarily out of volitional control, and is thereafter always reintegrated at a more acceptable level. (Author's abstr.)

Convulsive Shock Therapy in Patients Over Seventy Years of Age with Affective Disorders.

Experience with a group of 30 patients all past 70 shows that convulsive shock therapy is well tolerated by the aged.

Convulsive shock therapy in the aged can be made more safe if curare modification of the convulsion is utilized. The organic defects and diseases of old age are not necessarily contraindications for curare electroshock therapy.

Follow-up studies show that half of this group of patients obtained sustained recoveries or sufficient recovery to remain functional in society.

Evaluation and retreatment of relapses suggest that prompt treatment of recurrences will produce an early remission and prevent prolonged hospitalization.

No conclusions can be drawn regarding the death rate in this group.

(Authors' abstr.)

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Sub-coma Insulin and Pentothal Sodium as Aids to Psychotherapy.

1. The technique of combined sub-coma insulin and pentothal narcosis in the treatment of 60 consecutive cases of prolonged anxiety was explained and the results analyzed.

2. Especially encouraging results have been obtained where the anxiety reaction has been superimposed upon a previously stable personality.

3. Although the superficial anxiety is usually all alleviated, if there have been longstanding emotional conflicts, more prolonged psychotherapy is usually necessary to influence them seriously.

4. Sub-coma insulin and pentothal should be looked upon as primarily supportive measures, but definitely serve to promote relaxation and to make the patient more receptive to psychotherapy.

5. It is felt that this form of treatment is practical in cases of prolonged anxiety reaction in civilian practice and is especially applicable to the treatment of this type of case on the wards of a general hospital. (Authors' abstr.)

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Cerebral Anoxia from High Altitude Asphyxiation: A Clinicopathologic Study of Two Fatal Cases with Unusually Long Survival, and a Clinical Report of a Non-fatal Case.

Three cases of anoxic anoxia occurring in aviators while engaged in combat are presented in detail. In two cases the anoxia proved fatal in forty hours and three weeks, respectively, and in the third instance the patient was observed for a period of three weeks and then was transferred to the United States. The degree and duration of anoxia in each case are not completely known. In the first, the accident occurred at an elevation of " more than 20,000 feet," the patient being found unconscious five minutes after completion of a bomb run, at which time resuscitation was commenced. In the second, the patient was exposed to an atmosphere at 24,000 feet for approximately ten minutes. In the third, it was at 27,000 feet that the oxygen tank of the plane was shot away, necessitating a rapid descent to 7,000 feet, during which time no effort could be made to revive the patient.

In the case of approximately forty hours' duration a conspicuous necrosis of ganglion cells was observed in laminas III to VI of the cerebral cortex, the striatum, the cerebellum, Sommer's sector of the hippocampus and the anterior horns of the spinal cord, mostly focal in character, and degeneration of myelin in the internal capsule. Also observed were early proliferation of the fixed tissue cells of the leptomeninges and vascular adventitia and mild exudation of lymphocytes and neutrophils into the meshes of the arachnoid, the perivascular spaces and, to a limited extent, the parenchyma of the brain. In the case of three weeks' duration the changes were of virtually the same location except that the cerebral white matter, brain stem and spinal cord were relatively spared. The profound damage in these cases of sudden and severe anoxic anoxia is strikingly similar to that observed in some of the other forms of anoxia. (Authors' abstr.)

Incidence of Anisocoria and Difference in Size of Palpebral Fissures in Five Hundred Normal Subjects.

Five hundred neurologically normal persons were studied with reference to the incidence of anisocoria and of differences in the width of the palpebral fissures. Nearly 17 per cent. of the patients showed a slight but perceptible anisocoria. In 4 per cent. the difference in pupillary size was pronounced. Inequality of the

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palpebral fissures of a slight degree was noted in nearly 36 per cent. of the patients. Pronounced differences were noted in nearly 6 per cent. When both the pupils and the fissures were unequal the smaller pupil and the narrower fissure were on the same side in 77 per cent. of the patients. However, in nearly one-half the patients with anisocoria the fissures were equal, and inequality of the fissures was accompanied with equality of the pupils in 73 per cent. of the patients revealing unequal fissures. Consequently inequality or imbalance of sympathetic innervation could be held responsible for at least some instances of the observed anisocoria, but in general no gross factor could be identified as responsible for any asymmetry of sympathetic stimulation. In other instances differences in errors of refraction may play a role in causing unequal pupils. The incidence of inequality of the palpebral fissures is relatively high, and mild degrees may be considered without significance. Anisocoria should never be dismissed as an anomaly until a thorough search reveals no etiologic basis for it. (Author's abstr.)

Relation of Mental Imagery to Hallucinations.

The mental imagery of 40 patients with schizophrenia, 10 patients who had recovered from an alcoholic hallucinosis and 114 normal subjects was tested.

Schizophrenic patients with auditory hallucinations were found to have a significantly lower mean percentage of auditory imagery than either normal subjects or schizophrenic patients without auditory hallucinations. The normal subjects and the schizophrenic patients without auditory hallucinations did not differ significantly in this respect.

Patients who had recovered from alcoholic hallucinosis were found to have a significantly lower mean percentage of auditory imagery than normal subjects. The mean percentage of auditory imagery for patients who had recovered from an alcoholic hallucinosis and for schizophrenic patients with auditory hallucinations did not differ significantly.

Not only do these findings disprove the old theory that auditory hallucinations are exaggerations of predominating auditory imagery, but they suggest the new concept that one of the factors responsible for auditory hallucinations is relatively deficient auditory imagery. (Authors' abstr.)

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Relation Between Electroencephalographic and Histologic Changes Following the Application of Graded Force to the Cortex.

A new method for the study of cortical cell change in connection with electroencephalographic deviations is introduced.

Electroencephalographic changes vary with the amount of cortical cell damage within a certain critical range.

Below this critical range cortical cell change occurs without corresponding electroencephalographic deviations.

Within the critical range the amount of electrical and cortical cell change is directly proportional to the amount of force applied to the cortex.

Localized cortical cell damage produces localized electroencephalographic changes.

Histologic changes assume a definite pattern of stratification, according to the amount of force applied to the cortex.

Electroencephalographic changes vary with the amount of force applied to the cortex. Reduction in amplitude is directly proportional to the amount of force delivered. The appearance of slow waves is inversely proportional to the amount of force applied to the cortex.

Unilateral convulsive electrical patterns were produced by the mechanical application of force to the cortex.

An attempt is made to relate the authors experimental results to the clinical findings following trauma to the head. (Authors' abstr.)

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Loss of Axis-Cylinders in Sclerotic Plaques and Similar Lesions.

Studies by means of the Bodian silver stain for axis-cylinders, which is uniquely specific and especially adapted to the purpose, showed that some degree of damage or destruction of axons occurred in all the sclerotic plaques investigated.

In all but two of the plaques examined the axis-cylinders were reduced to a small fraction of the normal number.

The pathologic appearance of surviving axis-cylinders was more striking in fresh plaques than in old ones.

Similar changes, of about the same degree of intensity, were seen in some other lesions of vascular origin, not sufficiently intense to cause complete necrosis.

The clinical correlation of these observations, especially with respect to treatment, is discussed. (Authors' abstr.)

Electrocerebral Shock Therapy: A Reconsideration of Former Contra-indications.

In a series of 2,181 intramural and extramural patients receiving electric convulsive treatment many presented conditions hitherto considered contra-indications to convulsive shock therapy, such as cardio-vascular disease with and without hypertension, pulmonary tuberculosis, pulmonary fibrosis, skeletal disorders, cerebral arteriosclerosis, general arteriosclerosis, advanced age and organic disease

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of the central nervous system in the form of syphilitic meningoencephalitis. With the exception of one death, that of a patient with known severe cardiac disease occurring four weeks after a course of three treatments, there were no complications of moment, and the results from the psychiatric standpoint were more than gratifying. A second death occurred in a man, aged 44, who offered no contra-indications to treatment. Representative cases are cited in which the aforementioned contra-indications existed and treatment was safely and successfully carried out.

It is felt that the former arbitrary and rigid contra-indications to electric convulsive therapy should be relaxed so that many more persons may derive the benefits to be obtained from such treatment. However, there should be no relaxation in the exercise of proper caution in the selection of patients for treatment, the choice to be determined by the overall physical status of the patient, the severity of the presenting psychosis, the immediacy of the need of treatment and the promise of a favourable result. (Author's abstr.)

Electroencephalographic Study of Electric Shock Therapy: Psychotic Patients Treated in a United States Naval Hospital.

In electroencephalographic studies on a series of 106 psychotic men at a naval hospital given varying courses of convulsive therapy with unidirectional current, the following observations were made:

1. The preshock electroencephalograms showed no more abnormalities than are found in comparable normal control records.

2. With shock treatment almost all the patients manifested disturbances in cerebral physiology easily demonstrable in the electroencephalogram. The degree of change varied roughly with the number and the frequency of treatments, but there were many noteworthy exceptions.

3. In the majority of cases the electroencephalogram showed a considerable or a complete return to normal within two weeks after cessation of treatment. In a few cases the abnormalities were more persistent.

4. A careful comparative analysis of the electroencephalograms of the recovered patients (73 per cent,) failed to reveal any significant difference from the records of the patients who did not recover. It is concluded, therefore, that the electroencephalogram does not offer a prognostic guide in electric shock therapy.

5. Likewise, no significant correlation was found between the disappearance or persistence of individual psychotic symptoms and the electroencephalographic pattern, or between the degree of sensorial disturbance and memory impairment and the degree of abnormality in the brain waves. It is thus concluded that the obvious changes in cerebral physiology registered in the electroencephalogram do not give a direct clue to the mechanism of healing in electric shock therapy.

(Authors' abstr.)

Electroencephalographic Studies Following Electric Shock Therapy: Observations on Fifty-one Patients Treated with Unidirectional Current.

Fifty-one patients admitted to the New Hampshire State Hospital received varying numbers of electric shock treatments administered by a machine delivering unidirectional, fluctuating current. Brain waves were recorded prior to treatment, four days after the last treatment and, again, fourteen days thereafter. An analysis of the records revealed the following facts:

1. The highest percentage of abnormal records was obtained in manic depressive patients, closely followed by that for the schizophrenic group. Patients with involutional psychoses and psychoneuroses demonstrated significantly more normal preshock records.

2. In general, an increase of abnormality in the electroencephalographic record was observed after treatment, characterized by increase in voltage, decrease in frequency and appearance of various other abnormalities.

3. The increase in abnormalities was usually directly proportional to the number of treatments.

4. The electroencephalograms of a large percentage of patients receiving less than ten shock treatments had returned to normal fourteen days after the last treatment. Of the group receiving more than ten treatments, a large proportion retained electroencephalographic abnormalities in this recording.

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5. In the group receiving ten treatments or less, the electroencephalographic changes seemed to be less pronounced after shock treatment when unidirectional current was used than when alternating current was used.

6. The age-groups between 15 and 24 years and between 45 and 62 years showed a much higher percentage of grossly pathologic electroencephalograms fourteen days after treatment than did the middle-aged group, between 25 and 44 years.

7. A small percentage of patients showed "improvement" in the electroencephalogram after electric shock treatments as compared with their preshock record, a fact which could not be explained and which was clinically unrelated to improvement.

8. Post-shock electroencephalograms closely resembled the records of epileptic patients. However, the breakdown during hyperventilation so characteristic of the electroencephalograms of epileptic patients was rarely observed in the records of patients receiving shock treatment.

9. The following clinical relation between various changes in the brain waves and the psychiatric picture were found: (*a*) An abnormal preshock electroencephalogram usually indicated that a longer course of treatment was necessary in order to achieve clinical improvement. (*b*) A highly abnormal electroencephalographic record fourteen days after the last treatment was usually found with patients requiring further hospitalization. (*c*) A normal preshock electroencephalogram promised a better clinical result from electric shock treatment than an abnormal preshock record. (Authors' abstr.)

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The Hippocampus and the Sense of Smell.

On the basis of data from the literature, a review is given of the anatomical and physiological aspects of the hippocampus of mammals, particularly as regards its alleged association with the sense of smell.

The olfactory fibres from the olfactory bulb and the anterior olfactory nucleus have not been traced to the hippocampus proper. A few fibres are found to the so-called anterior continuation of the hippocampus, which is rudimentary in mammals. The olfactory fibres appear to end only in the peri-amygdaloid and prepiriform area of the so-called piriform lobe, whereas it is doubtful if any reach

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its posterior part, the entorhinal area (which in man occupies most of the gyrus hippocampi). The afferent fibres to the hippocampus arise mainly from the entorhinal area, small additional contributions come from the posterior part of the cingular gyrus and probably from the induseum griseum.

All efferent fibres from the hippocampus leave the latter as the fornix. Some of its fibres end in the hypothalamus, the pre-optic region and the septal areas and the habenula, but most of them go to the medial and part of the lateral mammillary nucleus. From this a massive pathway leads through the anterior thalamic nucleus to the cingular gyrus.

From a structural point of view the hippocampus must be considered a typical effector structure, transmitting but a modest proportion of impulses ultimately olfactory in origin, integrated with others the nature of which is not yet known, to the cingular gyrus and to a lesser extent to the hypothalamic, pre-optic and septal areas and the habenula. All the latter connections are probably concerned in influencing subcortical reflexes, olfactory and others, as well as hypothalamic activity. The projection to the cerebral cortex is not understood from a functional point of view. It may be concerned in cortical control of autonomic functions.

Recent physiological experiments have yielded no support for the conception that the hippocampus has important relations to the sense of smell in mammals, nor does clinical evidence seem to favour this view. (Author's abstr.)

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The Adolescent in the Factory.

1. The majority of the adolescents interviewed had been eager to go to work on leaving school at fourteen, because they regarded working as :

(*a*) A new experience, about which there was lively curiosity, or

(*b*) A symbol of growing up, as conferring the status and privileges of the adult, or

(*c*) An opportunity to earn money, which itself was regarded as conferring the prestige and power of the adult, or

(*d*) An opportunity of a fresh start, after failure to make a satisfactory adjustment at school.

2. Owing to ignorance and economic pressure, together with an almost complete lack of guidance, they had been able to exercise little choice of work, with the result that their first eagerness had often been blunted very soon by frustration or disillusioning experiences in the first job.

3. The most prevalent attitudes to work and the work authority revealed by the adolescents in the two factories investigated were those of dissatisfaction and resentment.

4. Neither youth nor sex was found to be the decisive factor in shaping these attitudes. On the contrary, among both sexes the average number of complaints significantly rose with increasing maturity.

5. The dissatisfaction and resentment arose in the work situation itself, and were due to frustration of the adolescent's desires for satisfactory physical development, for security of social status in the factory, and for the acquisition of satisfactory skills in work.

6. These frustrations were attributed by the adolescent workers to physical conditions at work, to long hours, and to mass-production methods in use in these factories, for all of which they had been unprepared, owing to their ignorance of modern factory conditions. They contrasted all these conditions unfavourably with those at school, where the authorities had obviously been concerned about their physical welfare, where hours had been comparatively short, and where they had been given every opportunity to learn.

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7. For all these frustrations at work these adolescents blamed the work authority, because in it they had encountered, for the first time, an organized body of adults who, unlike the school authority, seemed to them to care nothing for their welfare.

8. They did not outgrow these feelings of dissatisfaction and resentment because, for the adolescent as a worker in this type of factory, time brings no such hope of developing individual capacities to maturity as it brings him in the wider field of experience outside. In such a work situation the adolescent, deprived of the opportunity to grow up vocationally, feels a sense of waste and frustration which is cumulative, and may be responsible for the attitude of aggression towards the work authority which is the underlying cause of many modern labour troubles.

(Author's abstr.)

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The Clinical Differentiation of Senile and Arteriosclerotic Psychoses.

Senile psychoses are commoner in women than men. They tend to begin later and to last longer than arteriosclerotic mental disease. The onset is gradual and the course steadily progressive, leading eventually to profound mental deterioration.

Arteriosclerotic psychoses are commoner in men than women. They may begin gradually or abruptly. The acute onset is marked by a confused or delirious state, with or without neurologic accompaniments. If this does not terminate fatally, it tends to subside, leaving as a rule a certain degree of mental deterioration, but occasionally leading to a good remission. When the onset is gradual, the picture is similar in many ways to that of senile dementia, both disorders presenting signs of intellectual failure, frequently with emotional reactions and disturbed behaviour. In arteriosclerotic psychoses, however, attacks of confusion may occur at any point, thereby producing a more stormy course with fluctuations in the severity of the mental disturbances.

The intellectual impairment is usually more pronounced in senile than in arteriosclerotic conditions. An exception to this is provided by the paranoid type of senile psychosis, in which the intellectual faculties may be relatively well preserved. However, outspoken and chronic paranoid syndromes are seldom noted in arteriosclerotic disorders. Severe hypochondriacal-like symptoms are often an early feature of the latter, but are not ordinarily prominent in senile psychoses.

While gross neurologic changes are characteristic of arteriosclerotic psychoses, they often fail to occur in the earlier stages, and they may be completely lacking. Cardiac disturbances are common in arteriosclerotic patients. Other characteristic but less frequent symptoms are headache, dizziness, syncopal attacks, convulsive seizures and explosive laughter or weeping.

Sclerosis of the peripheral arteries occurs with equal frequency in the two psychoses. Hypertension is almost as common in senile as in arteriosclerotic patients, though the latter are more apt to show increased diastolic pressures.

Diagnostic problems involving other mental disorders are discussed. The

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commonest sources of error are provided by psychoses associated with a variety of toxic or somatic conditions, some of which may be particularly difficult to separate from arteriosclerotic mental disease. Many mistakes owe their origin largely to an uncritical attitude whereby one tends to forget that mental illnesses which are neither arteriosclerotic nor senile are common in later life. (Author's abstr.)

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The Sentence Completion Test as a Projective Technique. *Symonds, P. M.* 320

Differential Test Responses of Normals and Mental Defectives.

The present investigation seeks to repeat and enlarge upon current studies of differential test responses of normal and defective subjects of equal mental age. Responses on the 1937 Stanford-Binet Scale, Form L, obtained from 441 defective subjects, were compared with responses of 1,326 members of the standardization group of the scale. A chi-square method of analysis revealed that thirty items of the scale differentiated reliably between the two groups. On eleven of these items the defectives were superior, and on eighteen of the items they were inferior. On one item the younger defectives were superior while the older defectives were inferior. An analysis of the differentiating items casts considerable doubt upon the common belief that defective subjects are superior in rote memory items. On the contrary, rote memory items were relatively harder for defectives than for normals of equal mental age.

Three hypotheses were advanced to account for the results: (1) That the easy items were dependent upon practical experience and therefore could be expected

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to be simpler for the older defectives; (2) that the difficult items involved more freedom from intrapersonal rigidity, as defined by Kounin, and hence might be hard for the older defectives; and (3) that the difficult items were more heavily loaded with the general first factor isolated by McNemar on the Stanford-Binet Scale. Evidence is cited suggesting that the first two hypotheses are not adequately supported by the data in the present investigation. The third hypothesis receives support when mean factor loadings of easy and difficult items are compared. It may be concluded that one explanation of the relative difficulty of certain Stanford-Binet test items for defectives, as compared with normals of equal mental age, is that these items are more heavily saturated with the general first factor which has been statistically isolated. (Authors' abstr.).

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The Test Performance of the Brain Injured.

This paper is a preliminary report of an investigation of the performance of fifty brain injured patients on the Bellevue Intelligence Scale, Form I. An item analysis is made of the eleven subtests. Pertinent data are presented and discussed. Emphasis is placed on the value of using the information subtest weighted score as a basal point for deviation analysis and patterning.

The findings indicate that the brain injured do poorly on the performance items as compared with the verbal items. Moreover, the full scale score reflects a depressed level of efficiency. The sequelae of brain damage by bullet or shrapnel have both overall effects and specific function impairment. The role of personality disturbance accompanying brain damage is indeterminate but effective.

Information, comprehension, and vocabulary are most resistant to damage. Picture completion and similarities withstand to a lesser extent the onslaught of encephalopathy. Arithmetic and picture arrangement fluctuate too widely for definitive evaluation. Most seriously and consistently affected are digit span, digit symbol, block design and object assembly. The specific functions involved in each are discussed.

The mean information weighted score is significantly higher than eight of the ten mean weighted scores as compared with only four reliable deviations from the mean vocabulary weighted score. The critical ratio values are significant enough to establish information as the most feasible basal point for test profiling of the brain injured.

The results also suggest that time and shift play an especially important part in determining function efficiency. (Author's abstr.)

Psychological Types and Changes with Age.

In a sample of 500 males and 500 females Jung's psychological types were examined for age-changes in successive five-year age groups. The notable inferences are that there is progressive though trivial decrease in the feeling-function, definite decrease in extraversion, and most marked decrease in the intuition-function. Or, conversely, it can be said that, as people grow older, they tend to use their thinking slightly more than in youth, to develop their introverted side more clearly, and to use their sensation-function considerably more than at earlier ages. (Author's abstr.)

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Personal Factors Influencing the Learning of the First Course in Psychology. *Magaret, A., and Sherriffs, A. C.* 67

The Use of Certain Psychological Tests in the Evaluation of Brain Injury.

A group of 92 brain injured and 108 control patients were given the Hunt-Minnesota Test for Organic Brain Damage. The groups were compared in regard to T scores, visual and auditory raw scores, learning and retention patterns, and interpolated tests. In addition each group was divided into three sub-groups on the basis of the 1937 Stanford-Binet Vocabulary test scores and were again compared in the way mentioned above. No factors were found which are of practical value in differentiating between the groups.

A comparison of the Shipley and Hunt tests was made. The results indicate that little relationship exists between the scores obtained on the two tests.

(Authors' abstr.)

J. GENET. PSYCHOL.

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The Efficacy of Electroshock Therapy in Preventing or Shortening Hospitalization.

This report deals with 242 patients treated with electroshock therapy in the office of the private psychiatrist. Of this number 152, or 63 per cent., were suffering from affective disorders and 77, or 31·5 per cent., from schizophrenia; 127 patients, or 52 per cent., recovered; 191 patients, or 79 per cent., benefited from treatment.

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Fifty-one patients, or 21 per cent., of the total were unimproved. Of these 51, 23 patients discontinued treatment prematurely. Fifteen patients, or 6 per cent., required subsequent hospitalization. It is the thesis of this paper that electro-shock therapy, given at the psychiatrist's office, prevents hospitalization in many cases and that such avoidance of commitment is of real benefit to the patient. (Author's abstr.)

AUGUST.

*Distribution of Carbonic Anhydrase in the Pallium in Nineteen Cases of Paretic Neurosyphilis. *Ashby, W., and Weickhardt, G. D.* . . . 107
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A Military Offensive Induced by Hypnosis. *Schneck, J. M.* 186
An Indirect Technique to Induce Hypnosis. *Adler, M. H., and Secunda, L.* 190

Distribution of Carbonic Anhydrase in the Pallium in Nineteen Cases of Paretic Neurosyphilis.

From a study of the distribution pattern of carbonic anhydrase by multiple determinations in the right and left hemispheres in the brains of 19 patients with paretic neurosyphilis, 11 were found to show marked irregularities in the enzyme content ; 8 did not show this tendency.

The 11 brains showing irregularities in distribution were from patients whose spinal fluid findings were still strongly positive, although 5 had received long and intensive treatment.

Of the 8 cases in which irregularities in distribution were not found the spinal fluid findings had either become negative or had shown substantial improvement before death.

Of the 8 cases in which differences in carbonic anhydrase content were not found and in which there was serologic improvement, 5 showed no clinical improvement. The 5 brains from these patients showed low uniform content of carbonic anhydrase, the pattern of which lacked the frontal occipital contour which to date is associated with mortality. (Authors' abstr.).

J. NEUROPHYSIOL.

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*Inhibition of Cholinesterase by Di-isopropyl Fluorphosphate, Physostigmine and Hexaethyl Tetraphosphate in the Roach. *Chadwick, L. E., and Hill, D. L.* 235

Further Localization and Analysis of Adrenergic Synaptic Inhibition.

1. The inhibitory action of adrenaline on sympathetic ganglia is localized to the synapses, and sympathetic fibers are shown to be unaffected.

2. When the synaptic action of adrenaline is followed without interruption (by continuous recording or continuous inspection on a suitable viewing screen)

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from injection to the development of full effects, it is evident that the initial action is an inhibition that is not preceded by facilitation.

3. The inhibitory action is interpreted as a primary mechanism reciprocating with the cholinergic excitatory mechanism at sympathetic synapses. A " post-inhibitory" facilitation is described and interpreted as a secondary event comparable to the " rebound " phenomenon, in the production of which the ganglionic ischemia produced by adrenaline may play a role. The interval between administration of adrenaline and the recording of effects will determine whether the primary or secondary effect will make itself apparent as the first recorded action.

4. The synaptic inhibitory action of adrenaline is demonstrated in all types of sympathetic ganglia. The action is, therefore, regarded as a generalized one on adrenergic neuro-neuronal inhibitory junctions. This enhances its importance as a potential physiological mechanism that could participate in synaptic transmission and constitute the basis for a " self-limiting homeostatic mechanism." It does not appear possible that the synaptic action of adrenaline can play any but a protective role in circulatory shock.

5. It is pointed out that it is essential to stimulate sympathetic nerves with fluid, non-polarizable electrodes if quantitative results are to be obtained, unless sufficiently supramaximal shocks are resorted to. Also spontaneous facilitation is apt to occur in sympathetic ganglia unless the stimulus rate is kept low and a good circulation maintained. (Authors' abstr.)

Effect of Parasympathetic Drugs on the Conditioned Response.

The effect of increased intrinsic acetylcholine on the central nervous system has been studied by means of the conditioned response. Eserine, prostigmine, atropine, magnesium sulfate and pilocarpine were used. Only eserine and prostigmine affected the conditioned response ; the latter appeared to alter the response by producing discomfort, due to increased intestinal activity. Eserine abolished the conditioned response for as long as two hours, presumably due to the increased acetylcholine in the brain. Magnesium sulfate and atropine each prevent the action of eserine. Pilocarpine exerts a transitory depression and later may facilitate the conditioned response.

Acetylcholine exerts a profound effect on the central nervous system, as indicated by the extinction of the conditioned response—but the mechanism for this action remains obscure. (Authors' abstr.)

Acetylcholine and Neuromuscular Transmission.

When complete block of neuromuscular impulse transmission is produced by soaking the frog's sartorius in 1 : 500,000 acetylcholine in the presence of 1 : 100,000 prostigmine, a nerve impulse still sets up an endplate-potential. With conditions just critical for neuromuscular block, the ACh e.p.p. is slightly larger than the " curare endplate-potential " and has a time course resembling that of the " curare-prostigmine endplate-potential."

The endplate-potential set up by rapid repetitive stimulation exhibits on cessation of stimulation quite discrete fast and slowly decaying components. The slow component is small with the curare e.p.p., and is selectively increased by prostigmine. It is also large with the acetylcholine endplate-potential.

Evidence is presented in support of the hypothesis that prostigmine abolishes the only means for rapid destruction of acetylcholine. The possible mechanism of acetylcholine block is discussed. (Authors' abstr.)

Acetylcholine and Synaptic Transmission in the Spinal Cord.

The hypothesis that acetylcholine (ACh) mediates synaptic transmission has been tested with the frog's spinal cord by investigating the effects produced by investigating the effects produced by abolishing cholinesterase activity by prostigmine (3 or 6 $\times$ 10^{-5} M) and then soaking the cord in strong ACh solutions (up to 6 $\times$ 10^{-3} M or even 1·2 $\times$ 10^{-2} M) in addition.

Prostigmine (like eserine) has no detectable effect on the synaptic potentials set up in the anaesthetized spinal cord by dorsal root volleys even when they are

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rapidly repetitive. The strong ACh solutions have about the same depressant action on the synaptic potential as is exerted on the endplate potential by 1/500 times that concentration of ACh.

In the discussion it is argued that, since the cholinesterase will have been virtually inactivated, these observations refute the hypothesis that ACh mediates synaptic transmission in the frog's spinal cord. (Author's abstr.)

Differential Spinal Block. III. The Block of Cutaneous and Stretch Reflexes in the Presence of Unimpaired Position Sense.

1. Position sense and stretch reflex afferents are probably mediated by separate groups of fibers.

2. Under the influence of a differential spinal block, the abdominal, knee-kick and ankle-jerk reflexes are abolished at a time when touch, position sense, vibratory sense and motor power are unimpaired.

3. If the interpretation is correct that the differential blocking effect in the subarachnoid space depends upon the degree of myelination and axon diameter, then it can be concluded that the afferent fibers of the above-mentioned reflexes are subserved by relatively small, unmyelinated fibers.

4. If the interpretation is correct that tendon reflex and position sense afferents are of the same axon diameter and myelinization, then it can be concluded that these latter are not the only factors upon which the differential effect in this type of spinal block depends. (Authors' abstr.)

Viscosity Changes in Axoplasm under Stimulation.

1. Axoplasm flows from all cut squid giant axons not stimulated above threshold after varying periods of elapsed time.

2. Axoplasm does not flow from any cut squid giant axon stimulated above threshold.

3. Failure of axoplasm to flow from cut squid giant axons stimulated above threshold indicates that the stimulating current has induced an increase in the viscosity of the axoplasm within the stimulated axons.

4. The resumption of axoplasm flow from cut squid giant axons within varying periods of elapsed time following cessation of stimulation just above threshold indicates that the process which induced the viscosity increase in the axoplasm is reversible.

5. The reversible changes of viscosity observed in axoplasm under stimulation indicate that the biochemical mechanism involved is probably gelation-solvation. (Author's abstr.)

Electrical Activity in Frog Spinal Cord.

1. In frogs, the isolated second segment of the spinal cord which remains in connection with the forelegs through the second spinal nerves manifests electrical activity. This activity is extremely irregular and differs from that of the intact cord by the predominance of slow waves.

2. A similar electrical activity can be registered from two or more segments of the spinal cord, providing they remain connected with the peripheral organs.

3. When the second spinal nerves, supplying the forelegs, are severed, the electrical activity of the isolated 2nd segment of the spinal cord diminished considerably. There remains the actual spontaneous electrical activity proper to the spinal cord, which activity, however, is a much weaker one. The same was observed after severing the nerve roots of the whole (or parts) of the spinal cord.

4. There exists a continuous interaction between the medulla spinalis and the peripheral organs, and also when the latter are in a state of complete rest.

5. The brain distinctly influences the electrical activity of the spinal cord; when the brain is eliminated electrical activity of the completely isolated spinal cord is reduced. (Authors' abstr.)

Inhibition of Cholinesterase by Di-isopropyl Fluorophosphate, Physostigmine and Hexaethyl Tetraphosphate in the Roach.

1. By means of a manometric technique it has been determined that di-isopropyl fluorophosphate (DFP), physostigmine salicylate, and hexaethyl tetraphosphate (HTP), in the concentrations which are toxic to the roach, *Periplaneta*

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americana L., inhibit the cholinesterase activity of roach nerve cord *in vitro* and *in vivo*.

2. The approximate range of concentrations over which these effects were observed were: for DFP, 1×10^{-6} to $1 \times {}^{-4}$ M; for physostigmine, 1×10^{-9} to 1×10^{-4} M; for HTP, 1×10^{-7} to 1×10^{-6} M.

3. With DFP it was found that the percentage of mortality after injection was paralleled closely by the degree of enzyme inhibition which resulted from the same dosage. The comparisons with physostigmine and HTP were less satisfactory.

4. The following LD50s were determined for the compounds by the injection in aqueous solution: DFP, 5·2 mgm. per kgm.; physostigmine salicylate, 15·6 mgm. per kgm.; HTP, 6·75 mgm. per kgm.

5. Although the possibility of other toxic mechanisms for these agents is not excluded, it is concluded that their toxicity is largely a function of their anti-cholinesterase activity. The significance of the findings for certain theories of nervous transmission is discussed. (Authors' abstr.)

JULY

*Electrical Investigation of the Monosynaptic Pathway Through the Spinal Cord. *Brooks, C. McC., and Eccles, J. C.* 251
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*Respiratory Effects from Stimulation of the Afferent Vagus Nerve of the Monkey. *Wyss, O. A. M.* 315

Electrical Investigation of the Monosynaptic Pathway Through the Spinal Cord.

The electrical events involved in transmission through a monosynaptic pathway of the spinal cord (quadriceps afferent fibres to quadriceps motoneurones) have been directly recorded by means of a fine needle electrode (insulated to the tip and inserted into the quadriceps nucleus) and an indifferent electrode. The focal potentials so obtained have been subjected to experimental analysis and to interpretation in the light of the theory of focal recording. It has thus been possible to identify the three main components of the complex electrical potential wave set up in the quadriceps nucleus of the spinal cord by a volley in the quadriceps afferent fibres: The diphasic spike set up by presynaptic impulses propagating to their terminals; the synaptic potential of the motoneurones; the spike response of the motoneurones when they initiate the discharge of an impulse.

The focal potential is simplified by making the orthodromic volley small and by deep anaesthesia. Both these procedures eliminate not only the spike responses of the motoneurones, but also the action on them of impulses relayed through interneurones. The focal potential then is produced by a virtually synchronous volley of impulses in the presynaptic terminals and the resulting synaptic potential of the motoneurones, and it has a standard time course. The synaptic potential begins 0·3 to 0·45 msec. after the arrival of the presynaptic impulses, and it rises to a rounded summit in about 1 msec., thereafter decaying approximately expotentially with a half-time of about 1·5 msec.

The synaptic potential recorded from the emerging ventral root has an identical synaptic delay, but a much slower course of rise and decay. It is shown that this divergence should occur if both potentials were produced by a soma depolarization having an intermediate time course.

The excitability of the motoneurones before and during the synaptic potential has been tested by direct and by antidromic stimulation. No significant change is detectable during the early part of the synaptic delay, but there is an abrupt rise of excitability slightly preceding the rise of the synaptic potential. This excitability then decays more slowly than the focal synaptic potential, but possibly with much the same time course as the soma depolarization. It is shown that

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these excitability changes agree with those disclosed by synaptic excitation (the familiar facilitation curve), and that all three may be attributable to the synaptic potential. Thus even direct recording from the synaptic region reveals no post-synaptic excitatory process other than the synaptic potential and the soma spike potential initiated thereby.

All the observations agree closely with the predictions of the electrical hypothesis of synaptic transmission. (Authors' abstr.)

Cerebral Regulation of Motor Co-ordination in Monkeys Following Multiple Transection of Sensorimotor Cortex.

1. Multiple intersecting knife cuts were made in the cerebral cortex of monkeys throughout the sensorimotor arm field with overlap into neighbouring cortical areas. These incisions extended roughly through the gray mantle in a vertical plane so as to interrupt and distort all patterns of horizontal intracortical transmission either of definitive excitations over neuronal pathways or of mass intercellular electrical currents. At the same time the cuts left intact the interconnections between separated cortical points via fibers through the medulla.

2. When the incisions were confined to the exposed cortex and extended only as deep as the upper third of layer VI without encroaching on the white matter, the effect on motor co-ordination was negligible. Only a slight and transient depression of function resulted when such incisions were extended into the depths of the fissures. Symptoms of functional depression became increasingly apparent as the incisions, especially in the precentral motor area, were made deep enough to invade the medulla. Nevertheless, when cuts extending into the white matter completely through the transition zone in the lower part of layer VI were placed throughout the sensorimotor arm area, including the depths of the fissures and with extensive overlap into bordering cortical fields, no impairment of motor function could any longer be detected as early as three and one-half weeks after operation. With the electrostimulable foci for movement of shoulder, elbow, wrist, and digits as well as the corresponding sensory points permanently separated from each other as described, there was no inco-ordination in arm and hand movements, reflex, or voluntary, nor did brief tests indicate any deficiency in capacity for motor learning. Typical motor reactions were elicited by electrical stimulation of the partitioned motor area following functional recovery, and typical paralysis resulted thereafter upon its mass removal.

3. The functional symptoms which were observed were characteristic entirely of depression and afunction rather than of positive disorganization, and they appeared to be correlated primarily with invasion of the white matter.

4. The results fail to confirm theories of brain function which have assumed that horizontal intracortical transmission either of discrete excitations or of mass field forces plays any major or essential role in cerebral organization.

(Author's abstr.)

Single Fibre Analysis of Inhibition and the Polarity of the Retinal Elements.

Single fibre reponses have been isolated from the nasal region of the cat's retina with the micro-electrode technique and tested by illumination and polarization of the retina between fixed electrodes.

The pure on-elements respond to threshold cathodal polarization with an on-effect. An increase of current strength by some 30 per cent. elicits a threshold anodal off-effect.

The pure off-elements (inhibited by light) have opposite polarity. They respond to cathodal polarization at the threshold with an off-effect, to anodal stimulation of the same strength with an on-effect (not elicitable by light).

The on-off-elements are either " cathodal " or " anodal " depending upon their off/on-ratio determined by illumination at threshold strength. They are held to be combinations of on-paths and off-paths.

The results form the basis of a simple explanation of the nature of inhibition in the retina in terms of the horizonal and amacrine cells. (Authors' abstr.)

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Colour Sensitivity, Contrast and Polarity of the Retinal Elements.

The micro-electrode technique and the cat's retina have been used for a first analysis of the spectral sensitivity of well-isolated retinal elements during anodal and cathodal polarization. It was found that, depending upon the polarity, different spectral regions were enhanced or depressed, so that polarization proved a convenient and very direct method of colour analysis.

The on-elements were sensitive to short wave-lengths only, the off-elements to both long and short wave-lengths ; the on-off-elements had humps or depressions in various regions. The regions in which enhancements or depressions chiefly occurred were (in the order enumerated) 0·520, 0·600, 0·470 and 0·570 μ, the humps in 0·600 μ being particularly large.

The on- and off-components of the isolated spike of an on-off-element were often differentially sensitive to " contrasting " regions of the spectrum, suggesting that the two components are running indifferent but adjacent and well-synchronized fibers. (Author's abstr.)

The Projection of the Frontal Lobe on the Hypothalamus.

By the method of physiological neuronography, discrete projections have been demonstrated from area 6a of the cortex to the mammillary nuclei, the lateral hypothalamic area and to the posterior hypothalamic area. Projections have been demonstrated to the supra-optic and paraventricular nuclei from specific areas of the frontal lobe and the orbital surface, the latter also projecting to the posterior hypothalamic area. (Authors' abstr.)

Respiratory Effects from Stimulation of the Afferent Vagus Nerve of the Monkey.

Electrical stimulation of the afferent vagus nerve in the monkey produces at low stimulus frequencies and low intensities a weak inspiratory reaction. By increasing either the intensity or the frequency of the stimuli, the weak inspiratory effect is converted into one of a strong expiratory pattern. The principle of a frequency-conditioned reversal in vagal respiratory reflexes applies for the monkey as well as for cats, dogs and rabbits. A distinction has been made between the specific vagal respiratory effect and a non-specific acceleration of breathing which may be due to simultaneous stimulation of chemoreceptor or pain fibres.
(Author's abstr.)

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A Mid-Brain Syndrome Following Head Injury.

Nine cases of severe closed head injury with severe signs of mid-brain injury are reported. The dominant clinical signs were cerebellar, and included severe dysarthria and disturbance of balance. The cerebellar signs were usually most pronounced on one side, and the limbs of the side showing the maximum ataxia tended also to have increased tendon reflexes, Parkinsonian-like tremor, and, in one case, sensory loss suggesting injury to the medial fillet. These signs are thought

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to indicate injury to the mid-brain above the decussation of the superior cerebellar peduncles. Additional signs of mid-brain damage were oculo-motor and pupillary disturbances. In at least one case there was early rigidity of all four limbs.

In two cases air encephalography disclosed a marked dilatation of the aqueduct of Sylvius. (Authors' abstr.)

An Outbreak of Atropine Poisoning.

Clark (1940) states that atropine paralyses parasympathetic nerve endings by inhibiting acetylcholine, and that it has a variable stimulating action on the sympathetic, largely masked by the dominance of the action on the parasympathetic endings. Moderate doses produce cerebral stimulation, and there is stimulation of the lower motor centres of the brain. The action is known to be prolonged.

The dose of the liquor is 0·5 to 1 minim, that is 1/200 to 1/100 of a grain of atropine sulphate; 0·5 gr. has proved fatal, but, in a most exceptional case, a dose of 15 gr. was survived. Susceptibility varies enormously. No case in this series had as much as 1 gr.

The acute signs and symptoms are dryness of the skin and secretions, dizziness, impaired vision, dilated pupils, and greatly increased pulse rate, with some increase in respiratory rate and a slight rise of temperature. Excitement, garrulity and restlessness follow, and may lead on to delirium with hallucinations and finally coma. Epileptic attacks may occur, with paralysis of medullary centres. Munns (1929), writing of children under a month old, wonders if the heat-regulating centre is affected.

Young children are known to tolerate its action well, and sensitivity increases with age. Metivier (1935) describes an unusual reaction in a woman of seventy-four, who developed excitement and pleasing hallucinations after being given atropine eye drops. Carter (1940) describes the case of an old man of seventy-three who took 1·2 gr. of atropine. Treatment was not started for ten hours, when convulsions commenced. There was coma, dilated and fixed pupils, retention of urine, dry mouth, stertor, a rapid pulse, and spasticity and profuse perspiration. The spasticity is interesting in view of the rigidity in the attacks described above. Carter's patient was persistently trying to get out of bed and was hallucinated, picking at the bed clothes and later complaining of blurred vision. On the second day he was elated, excited, very talkative, and complained of headache. He had recovered by the fourth day. Concerning the variation in pupillary size, it is interesting to recall the findings of Levine and Schilder (1942) in catatonics. After the instillation of atropine they noted in a proportion of these an inconstancy of pupillary reaction to light and before fixation, suggesting an autonomic imbalance with parasympathetic dominance.

In view of the comparative smallness of the dose of atropine in the cases reported here, and the fact that the prescription was spread over a period of up to ten days, the conclusion can hardly be escaped that the narcotic not only masked the action of the atropine effectively, but also in some way reduced its excretion, so that at the end of treatment an effect was rapidly produced as if something like the total atropine given was acting as a single dose. There was no evidence of renal damage, but there may have been selective changes in kidney function. The striking nature of the parasympathetic-sympathetic swings, which gradually grew in intensity following the cessation of treatment, suggest a " blocking " of hypothalamic cells with dial, followed by a sudden invasion of atropine as the dial was excreted.

Mental illnesses indistinguishable from schizophrenia have been produced by the events here described. These cases closely simulated catatonic excitement, and four cases showed the almost pathognomonic " thought reading and influence by external agencies " of schizophrenia. Daube (1942) has described four cases of " pervitin " psychosis with a general picture of paranoid ideas, illusions, hallucinations, restlessness, irritability, and pronounced anxiety. Some patients were euphoric. These symptoms are similar to those described in the present paper, and suggest a non-specificity in the causal agents which, acting on cortex or mid-brain, or both, can produce schizophrenia-like reactions. Ivy and Goetzl (1943) also have described the excitement produced by " pervitin," and benzedrine-like substance. The strong resemblance to schizophrenia produced by mescaline intoxication which was described by Stockings (1940) is closely paralleled by the cases

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described in this paper. The cortical effects of atropine must not be forgotten, but it is tempting to postulate that the dial facilitated a preponderating effect on the hypothalamus. The autonomic disturbances, and the unusual resemblance to insulin coma in one case, suggest a hypothalamic intoxication producing an illness indistinguishable from some forms of schizophrenia. Insulin acts primarily on the parasympathetic, presumably causing a pendulum over-action of the sympathetic and waves of adrenaline secretion. Here the parasympathetic may be paralysed, possibly freeing the sympathetic, or the actual hypothalamic cells may be disturbed in their action. (Author's abstr.)

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Lesions of the White Matter of the Central Nervous System.

A detailed histopathologic study was made of cases of encephalopathy following chemotherapy, brain injury, cerebral fat embolism, inflammatory disease of the nervous system and carbon monoxide exposure where the brunt of the disease fell on the white matter. A characteristic vascular alteration, described under the heading of *vasoparalysis*, was demonstrated in many of these cases. *Vasoparalysis* was confined chiefly to the veins and capillaries of the white matter.

The retarded circulation interfered with an adequate supply of nutrition to the vessel wall itself; if the alteration was severe enough and of prolonged duration, there occurred degeneration of the vessel wall which led to increased permeability. This mechanism would account for edema and hemorrhage, which were frequently observed to be confined to the white matter.

Different regions of the central nervous system are characterized by differences in pattern of their blood supply. The view has been expressed that the regional peculiarities of vascularization of the white matter appeared to be responsible for its selective vulnerability. It was demonstrated that the severe form of tissue destruction was seen in areas with the poorest blood supply. The region with the most abundant vascular supply, the central cortex, was relatively spared in these cases. (Author's abstr.)

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Modern Considerations of the Man with Brain Injury.

The continued management of the man with brain injury requires healt optimism and enthusiasm balanced by an acute sensitivity to each man's distr and deficits and what these mean to him. Each patient must be surveyed b logically and understood as a complex, individual, peculiarly integrated organis incomprehensible if we restrict ourselves to only a few methods of examining hi

In rehabilitation great possibilities and resources lie within the host himse for it is his biological make-up and resiliency that remain as potent factors wi which to work.

Without therapeutic push under supervision we shall never fully appreci what assets each patient can muster. With good rapport, knowledge of the patie and his tolerances, and the control of extraneous or experiential factors that hind these tolerances, each patient will continue to improve for a long time.

The constant presence, inseparability and interaction of organic and functio aspects must be appreciated and worked with. Time is ill-spent in impossib attempts to label each patient as functional or organic. The neurophysiologi integration of each individual differs and resounds to the intracranial alterati in its own peculiar manner. Only when the individual who has the brain injur is known can the problems of distress, deficit and disability be comprehended

It is dangerous to oversimplify these problems merely because organic findin are present. A ventricular dilatation or abnormality in the EEG tracing do n account for every symptom. The future of these men will be tragic if managemen is oriented only to the cerebral scar, the EEG tracing, the aphasia or the hemi plegia.

The physician himself may present experiences to the patient which have lon disabling repercussions. Vacillation, overcaution, slips of the tongue, pessimism failure in formulations to the patient or relatives, reference to the EEG tracing and X-rays and the constant encouragement of invalidism are avoidable. Emphasis is put on the cheerful spirit of rehabilitation and indicating to each patient his own responsibilities and resources in convalescence.

Headaches, dizziness, paralysis, sensory losses, convulsions, intellectual deficits, emotional instability and psychotic reactions may continue in the traumatized organism. Regardless of what physiological functions are fundamentally dis- turbed, these have already been peculiarly altered by the life-long and concurrent accumulation of experiences, associations and conditionings contained in the individual organism.

Physician and patient alike must recognize that the brain, like other vital systems, provides a margin of safety whereby alteration of some portions may effect little functioning deficiency. It is unwarranted to assume that brain damage must equal disability, gram for gram, or per cent. for per cent.

(Author's abstr.)

Cerebral Swelling. Histopathology, Classification and Clinical Significance of Brain Edema.

The gross and histopathologic findings of cerebral swelling in 125 cases have been studied.

Regardless of the primary cause of the cerebral swelling (brain tumor, cerebral abscess, massive hemorrhage or cerebral infarction), the findings in all cases were identical.

Attention is called to the incompleteness of understanding of cerebral swelling on the part of both clinicians and pathologists, and to the prevalence of contradictory concepts relative to the condition.

" Cerebral swelling " is the term proposed to denote the gross appearance of a brain characterized by a local or diffuse increase in bulk of one or both hemispheres.

The condition referred to grossly as " cerebral swelling " is represented microscopically by three types of histopathologic change, described as tumefaction, edema and liquefaction. The characteristic histological criteria for recognition of and differentiation among the three types of lesions are given in detail.

Despite discrepancies in their histopathologic features, it is assumed that fundamentally the three conditions represent different stages of the same biologic process; occasionally they may merge insensibly one with another. Attention is

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drawn to the significance of unilateral cerebral swelling in the production of transtentorial brain stem herniation.

The role of cerebral swelling in the production of midbrain hemorrhages is emphasized. These are believed to be perivenous in origin, and to be caused by an extreme degree of venous congestion resulting from compression and strangulation of the veins of the herniated midbrain.

In view of the gravity of the clinical symptoms resulting from transtentorial herniation of the brain stem, an attempt to distribute pressure more evenly by means of the establishment of ventricular drainage or by means of section of the free edge of the rigid tentorium may be a life-saving measure, pending final and more radical treatment. (Author's abstr.)

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Central Control of Nervous Functions and the Problem of Sleep.

After a review of the chronaxie theory and the experimental work on identification of the role of the cerebellar Purkinje cells and the red nucleus of the midbrain in effecting the isochronism between peripheral and cortical cells which determines the routing of nerve impulses, the writer goes on to a consideration of the effect of this regulating center upon cortical activity. Suppression of the "subordinating" influence of the center allows the peripheral neurons to return to their "constitutional" chronaxie and results in an increase in cortical chronaxie as well—the inference being that this higher level represents the constitutional chronaxie of the cortical cells. When the level becomes too high the cortex no longer gives evidence of excitation, and simultaneously, the cerebellar regulating center ceases to function. With variations this is the state of affairs in hemiplegia, anesthesia, hypnosis, insulin shock and sleep. The last may be the effect of shutting out afferent impulses to the cortex, which in turn suppresses the cerebellar center, or may be at other times the result of a protective reflex controlled by a center anterior to the red nucleus responding to the toxins of fatigue.

M. R. SHEEHAN (Psychol. Abstr.).

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Effects of Vitamins A and D in Convulsive States.

No appreciable change either in the frequencies of attacks or in the general physical and mental conditions of the patients were noted after two to three months of vitamin A and D feeding. (Authors' abstr.)

Shock Therapy During Pregnancy.

1. Three cases of pregnant patients who have been treated with various forms of shock therapy are added to those already reported.

2. One manic-depressive went through pregnancy uneventfully while receiving electric convulsive therapy in the sixth and seventh months of gestation.

3. One paranoid schizophrenic miscarried at about four months while receiving her third course of combined electric convulsive therapy and ambulatory insulin.

4. One paranoid schizophrenic went through pregnancy to normal delivery while receiving 90 days of insulin (including eight genuine coma days) and 20 electric convulsive treatments in the fifth, sixth and seventh months of gestation.

5. Pregnancy should not necessarily be considered an indication to deprive a psychotic woman of needed shock therapy. (Author's abstr.)

Clinical Evaluation of a New Sedative-hypnotic (3, 3-*Diethyl*-2, 4-*Dioxotetrahydropyridine*) *in Psychiatric Conditions.*

The study comprised 100 psychiatric patients. NU-903 was used as a somnifacient in 90 cases, who received a total of close to 600 individual doses, usually 0·2–0·4 gm. Results were good to excellent in 61 patients and unsatisfactory in only four. NU-903 was administered for daytime sedation to 43 patients of whom 12 showed poor results and 17 responded with relaxation. The balance of the cases in both groups were classified as fair responses.

The drug proved to have a negligible percentage of after-effects. Six patients whose intake of NU-903 ranged from 17·6 to 33·2 gm., with the medication extending from 31 to 105 days, experienced no ill effects whatever. Moreover, the drug

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proved free from habit-forming effects, and its efficacy was not reduced by continued administration.

The effect of prolonged medication on the blood picture was studied in 10 cases. With some deviations these subjects received 0·6 gm. of NU-903 nightly over a period of four weeks. No striking changes in either the red or white blood picture were observed. However, one patient developed a transient, slight leukopenia. Whether the prolonged administration of the drug caused the shift in the white blood count was impossible to ascertain, since repetition of the test had to be interrupted after 19 days. At that time and after a total intake of 11·4 gm. of NU-903 blood findings were normal in this patient.

Results attending the use of NU-903 as a daytime sedative were satisfactory in patients presenting mild tension, anxiety and restlessness. In cases of severe agitation, however, the drug was not sufficiently effective to warrant its recommendation in such a type of psychiatric disturbance.

NU-903 has a distinct value as a quick-acting hypnotic of comparatively short duration in cases of mild and medium insomnia. Except for cases of very severe insomnia in which the preparation was not tried, NU-903 has the advantage over barbiturates of lesser toxicity and therefore better tolerability. Thus, clinical results substantiate the salient pharmacological findings. (Authors' abstr.)

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A Study of First Admissions with General Paresis to Hospitals for Mental Disease in New York State, Year ended March 31, 1945.

1. The rates of first admissions with general paresis have been declining steadily since 1918. The declining trend is more marked among males than females.

2. There has been a declining trend in the percentage of cases in which syphilis was considered a causative factor in mental disease.

3. First admissions with general paresis are younger than all first admissions. Male general paretics are older than female general paretics.

4. The rates of first admissions with general paresis rise to a maximum of 28·2 per 100,000 population among males at the ages of 45 to 49. Among females they rise to a maximum of 7·0 at the ages of 40 to 44.

5. In those age groups with significantly large totals of first admission, the annual rates of first admissions among males exceed those of females in ratios of 3 and 4 to 1.

6. The percentage of first admissions among general paretics with subnormal intelligence is significantly lower than that for first admissions with alcoholic psychoses and for those with dementia praecox, but much higher than that among manic-depressives.

7. First admissions with general paresis include a high percentage with low levels of education, as compared with the general population.

8. General paretics include a higher percentage with normal personality make-up than do all first admissions.

9. Rates of first admissions with general paresis are highest among the divorced and separated. Among males the married have a lower rate than the unmarried. Among females, on the contrary, the unmarried have lower rates than the married.

10. Rates of first admissions with general paresis are higher among urban than rural populations. The farm population has a lower rate than the non-farm population in rural areas.

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11. The rate of intemperance is higher among first admissions with general paresis than among any other groups of first admissions, exclusive of those with alcoholic psychoses. Intemperance is especially high among female paretics.

12. Negroes and other colored races (i.e., Chinese) have higher rates of general paresis than whites.

13. Foreign-born white males have a higher rate of general paresis than native white males. Foreign-born white females have a lower rate than native white females.

14. Those born in Ireland and Russia have low rates of general paresis. Foreign-born groups with high rates include those from Scandinavian countries and the West Indies. (Author's abstr.)

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Psychological and Psychophysiological Significance of the Electroencephalogram.

Failure of electroencephalography to make important and extensive contributions in the field of psychology is inferred to indicate either (1) that we have not understood the psychophysiological implications of the electroencephalogram or (2) that the more prominent features of the EEG do not provide a record of the integrative activity of cortex. That the EEG is not primarily a record of the integrative activities but of facilitative and homeostatic regulatory processes which contribute to but which are not essential to integrative cerebral function is shown from the available evidence. It is shown that the activity recorded by the electroencephalogram is part of a mechanism of regulation which maintains varying degrees of equilibrium among the four variables, alpha rhythm, cortical integrative activity, chemical condition and cerebral circulation, with the autonomic nerves to the brain providing an important contributing influence. It is shown how each of these affects each of the others and how an imbalance in the direction of either under- or over-regulation may give rise to psychopathological effects. Implications regarding possible mechanisms of " tension " anxiety, schizophrenia and emotional " functional decortication " are considered with respect to frequently observed effects on the electroencephalogram. Applications in psychology are considered. (Author's abstr.)

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1. Anatomy, Biochemistry, Physiology, Pathology, etc.

The C.S.F. and the F. W. Lorenz Reaction for Diagnosis of Syphilis. Covarrubias, A. R. [*Arch. farm. y Bioquím., Tucumán.*, **3**, 45 (1946).]

The Lorenz Reaction was found to be rapid, convenient and fully as reliable as the other commonly used reactions. L. E. GILSON (Chem. Abstr.).

Comparison of the Colloidal Benzoin Reaction with the Reaction of Dognon in Pathological Spinal Fluids. Guillain, Georges, Laroche, Guy, and Lereboullet, J. [*Bull. acad. med.*, **130**, 432–4 (1946).]

Dognon's reaction requires less cleanliness of equipment and can be performed with 6 drops of liquid, but is less sensitive than the colloidal benzoin reaction. A. E. MEYER (Chem. Abstr.).

Investigations of the Cerebrospinal Fluid in Cases of Rheumatoid Arthritis. Sundelin, Frederick (*Nynas Sanatorium, Nynashamn, Sweden*). [*Am. J. Med.*, **2**, 579–87 (1947).]

The spinal fluid was examined in 141 cases of rheumatoid arthritis. Almost half of these patients showed some abnormality of their fluid. An increased average globulin-albumin quotient is due to an increase in globulin and decrease in albumin. Although such abnormalities could not be correlated with neurological changes, these manifestations may be an indication of nervous system involvement in rheumatoid arthritis. BARBARA R. MURRAY (Chem. Abstr.).

Determination of Protein in Serum and Cerebrospinal Fluid by Formation of Unimolecular Films. Bateman, J. B. (*Mayo Clinic, Rochester, Minn.*). [*J. Cellular Comp. Physiol.*, **29**, 85–9 (1947).]

The protein in a volume of 0·0001 to 0·02 c.c. is caused to spread over the surface of a 3 per cent. NaCl solution. The film is compressed until a spot of "indicator oil" shows first-order blue color. The relation between concentration and area covered by the protein at a given surface pressure is linear for diluted normal and nephrotic serum, serum albumin and globulin and cerebrospinal fluid at concentrations below 100 mgm./100 c.c. H. L. MASON (Chem. Abstr.).

Urobilinogen in Cerebrospinal Fluid. Naumann, Hans N. (*Taunton State Hosp., Taunton, Mass.*). [*Proc. Soc. Exptl. Biol. Med.*, **65**, 72–4 (1947).]

Of 41 post-mortem cerebrospinal fluids examined, 6 contained urobilinogen in amounts from traces up to 9 mgm. per cent. L. E. GILSON (Chem. Abstr.).

Changes in [*Plasma*] *Electrolytes During Post-convulsion Coma. Cicardo, V. H.* [*Rev. Soc. Argentina Biol.*, **22**, 255 (1946).]

In dogs, coma following intense convulsions provoked by electrical stimulation of the brain, or by metrazole is accompanied by a marked increase in plasma K and total acid-soluble P. The plasma K reaches its highest concentration during the coma and decreases during recovery. Total acid-soluble P generally reaches its highest value only after complete recovery of the animal. This suggests that K may be the toxic agent which is responsible for post-convulsion depression. Liberation of K and phosphate is due to tissue anoxia. Much K is liberated by the liver. L. E. GILSON (Chem. Abstr.).

The Influence of Carbon Monoxide on Higher Nervous Activity. Frolov, Yurii P. [*Am. Rev. Soviet Med.*, **4**, 90–1 (1946).]

Various degrees of CO poisoning can be observed by giving subthreshold doses of CO which will accustom an organism to the poison. Severely poisoned newborn white rats and dogs whose brain cortex is not yet fully developed are not sensitive or show little reaction to CO in large concentration (4·1–7·5 mgm./1). Although the absorption of CO by the blood of both adult and young animals was the same and the respiratory functions in both cases were reduced to 70–80 per cent., the absence of a developed brain cortex in the newborn prevented death even with strong concentrations. In experiments on 6 dogs with different forms of higher

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nervous activity behaviour, single and repeated CO poisonings showed clear-cut functional changes in the major cortical processes of excitation and inhibition, while the lower parts of the brain and the pons variolii were unaffected. In particular the unconditioned salivary reflexes remained unchanged; there was a considerable decrease in the conditioned salivary reflexes and a weakening of active internal inhibition. A weakening of the conditioned motor reflexes indicated changes in the motor zone of the cortex. Disturbances of peripheral type were observed, especially eczema. W. R. HENN (Chem. Astr.).

Direct Action of Chemical Substances on Nerve Centers in Physiology and Pathology. Shtern, L. S. (Physiol. Inst. Acad. Sci., Moscow). [*J. Physiol. (U.S.S.R.)*, **32**, 577–88 (1946) (*in Russian*).]

Review of literature with 31 references precedes a *résumé* of more recent and current work of direct application of chemicals to the nerve centers in medicine and biology, which is based on the existence of the hematoencephalic barrier and of an antagonism between the central and the peripheral nervous systems in their reactions to chemical reagents. The method has been used successfully in work with tetanus and encephalitis; the impermeability of the barrier to the treating agents makes the conventional treatment rather ineffective, whereas the direct administration, such as injection into the spinal fluid, serves to eliminate this difficulty. The differences (antagonism) between the central and peripheral nervous systems to such agents as salts of K, Ca, hormones and hormone-like substances are discussed; these substances when introduced into cerebral ventricles cause an effect which is opposite to that produced when they directly come in contact with the peripheral elements. Positive results were obtained in traumatic shock when K phosphate was introduced into cerebral ventricles; similar results were secured in cases of otosclerosis, gastric ulcer, bronchial asthma and other cases of diminished sympathetic or increased parasympathetic tonus. Introduction of tissues, gastric mucosa, pituitary gland, into direct contact with nerve centers, produces an effect which is opposite to that caused by the same metabolites introduced in general circulation. G. M. KOSOLAPOFF (Chem. Abstr.).

Variations in the Angioscotoma in Response to Prolonged Mild Anoxia. Smith, G. M., et al. [*J. Aviat. Med.*, **17**, 590–595 (1946).]

The peripheral blind areas (angioscotomata) of 15 subjects were measured five times during a 7·5 hour exposure to a simulated altitude of 10,000 feet. Control tests were made at a simulated altitude of 1,800 feet with the same subjects. There is a statistically significant increase in the size of the scotoma at altitude. The results also show a progressive and significant increase in the size of the scotoma throughout the test period at altitude. A CHAPANIS (Psychol. Abstr.).

The Electrical Constants of a Crustacean Nerve Fibre. Hodgin, A. L., and Huxley, A. F. [*Proc. roy. Soc.* B**133**, 444–79 (1946)].

Theoretical equations are derived to describe the characteristics of the local excitatory process when a subthreshold stimulus is suddenly applied. Observations on a nerve taken from the walking legs of lobsters showed that (1) the rise and fall of the extrapolar potential at different distances from the point of stimulation conformed to the theoretically derived curves; (2) the steady extrapolar potential declined expotentially with distance; (3) the voltage gradient midway between two distant electrodes was uniform, and (4) the potential recorded was in fact from the membrane. Values (constants) were determined for the electrical resistance of the fluid outside the nerve fiber, the resistance of the axoplasm, the capacity, and the resistance of the surface membrane. The local response was also studied as the strength of the subthreshold stimulus was increased. Matters relating to theories of the nerve impulse are discussed.

A. C. HOFFMAN (Psychol. Abstr.).

Potassium Leakage from an Active Nerve Fibre. Hodgkin, A. L., and Huxley, A. F. [*Nature, Lond.*, **158**, 376–377 (1946).]

"According to the membrane theory of nervous action, a minute quantity of potassium ions should leak out of a nerve fibre each time that an impulse travels along it." Studies of the membrane conductance of stimulated axons immersed

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in oil indicate " that activity is associated with the leakage of a substance the effect of which on the nerve membrane is very like that of potassium . . . during the period of recovery, potassium appeared to be re-absorbed."

A. C. HOFFMAN (Psychol. Abstr.).

Effect of the Extirpation of the Abdominal Sympathetic Chain and the Removal of the Cerebellum on the Blood Sugar. Yankovskaya, Ts. L. [*J. Physiol. (U.S.S.R.)*, **32**, 365–76 (1946) (*in Russian*).]

Unilateral removal of the abdominal sympathetic chain causes a drop and in several experiments, also absence of the hyperglycemic reaction due to sugar in a dog. The effects of the extirpation of the cerebellum and of unilateral sympathectomy on the hyperglycemic reaction in dogs after sugar intake are opposite. The sympathetic nervous system is not a conductor of the reaction between the cerebellum and the carbohydrate metabolism. Both systems affect the blood sugar after sugar intake and independently. W. R. EICHLER (Chem. Abstr.).

Decrease of Phosphocreatine in Regenerating Neurons. Bodian, David, and Mellors, Robert C. (*Johns Hopkins Univ. Baltimore, Md.*). [*J. Biol. Chem.*, **167**, 655–61 (1947).]

Phosphocreatine determinations were made on normal and regenerating neurons of the ventral gray columns of rhesus monkeys. Regenerating ventral horn cells were produced by sectioning the left brachial plexus and the left lumbosacral roots at their exit from the intervertebral foramina. Regeneration was allowed to continue 6–30 days before analyses were made. The lumbosacral and cervical cords were removed from the living animal under ether anesthesia, then frozen quickly in alcohol dry ice mixture. The frozen segments were split longitudinally, the dorsal quadrants were cut away, then the gray matter of the central horns was isolated by scraping away the white matter. The ventral columns weighed about 80 mgm. each. Chemical determinations were made with a Coleman universal spectrophotometer. Right and left horns of the same section were compared. An average decrease in phosphocreatine of about 40 per cent. was found in regenerating anterior gray, as compared with normal gray columns. Adenosinetriphosphate values were too low for adequate analyses, but its value combined with inorganic phosphate was not significantly different from normal tissue.

ELVA G. SHIPLEY (Chem. Abstr.).

Succinic Dehydrogenase in Regenerating Neurons. Howe, Howard A., and Flexner, Josefa B. (*Johns Hopkins Univ., Baltimore, Md.*). [*J. Biol. Chem.*, **167**, 663–71 (1947).]

Comparison in succinic dehydrogenase content was made between normal anterior horns at the limb plexus level and corresponding tissues of animals with extremities completely paralyzed by poliomyelitis. In addition comparisons were made on normal and operated sides of the same animal. Rhesus monkeys were used throughout; the operations consisted of unilateral sectioning of the nerve roots at levels C_4–Th_1 and L_3–S_1. The animals were sacrificed at intervals from 7 to 54 days. Tissues were removed and frozen directly on a block of dry ice, and the white matter dissected away, leaving only the anterior gray cell column. Levels C_5–Th_1 and L_5–S_1 were used in the determinations, as these contained all the cells innervating an extremity (a limb segment). Succinic dehydrogenase was determined by the method of Schneider and Potter (*C. A.*, **37**, 5738[9]) or the method of Quastel and Wheatley (*C. A.*, **32**, 7069[2]). The isolated anterior horns of monkeys with limb paralysis following poliomyelitis were found to have approximately 40 per cent. less succinic dehydrogenase than corresponding tissue from normal monkeys. The difference is believed to be due primarily to the absence of anterior-horn cells, and calculations could be made for the activity of single motor neurons from the total normal activity and the number of cells. Maximal reductions of 12 per cent. in succinic dehydrogenase activity were found in anterior horns of animals with unilaterally sectioned nerve roots, as compared with normal sides of the same animal. Nerve section produces retrograde changes only in the motor cells of the anterior horn; thus the decreased activity was calculated to represent 30 per cent. reduction in enzyme activity in the motor cells.

ELVA G. SHIPLEY (Chem. Abstr.).

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Resonance of Excitable Tissues. II. Influence of Temperature and Decalcifiers on the Periodic Activity of Nerves. Monnier, A. M. (*Lab. physiol. gen. Sorbonne, Paris*). [*Arch. intern. physiol.*, **54**, 348–71 (1947); *cf. ibid.*, **48**, 129 (1939).]

Nerve preparations exhibit autorhythm in a medium low in Ca or containing Ca-binding ions, such as citrate, oxalate, or phosphate. The effect is greater for non-myelinized nerve preparations, and for specimens obtained from frogs kept at low temperatures. Maximum response of a given experiment is at 25–30°, but this temperature is lowered to 10° by 6–8 cycles of alternatively heating and cooling the nerve. H. L. WILLIAMS (Chem. Abstr.).

Inhibition by Sugars of the Stimulation of the Nervous System by Xanthine Bases. Chauchard, P., Mazoue, Henriette, and Lecoq, R. [*Compt. rend. soc. biol.*, **139**, 12–13 (1945); *Chimie and industrie*, **56**, 42 (1946).]

Subcutaneous or intraperitoneal injection of 0·005–0·010 gm. doses of theobromine or caffeine in the albino rat produces in about a week's time a decrease in chronaxia of motor nerves. If 0·5 c.c. of 0·5 per cent. lactose is injected simultaneously, this effect is prevented or cured after two injections. It was observed that this protective action was not specific for lactose but was shared by other ordinary glucides, such as sucrose, galactose, glucose, at the same dose. The same effect is obtained by oral administration.

A. PAPINEAU-COUTURE (Chem. Abstr.).

Mechanism of Paralysis Resulting from Toxin of Clostridium botulinum. *Action of the Toxin on Acetylcholine Synthesis and on Striated Muscle.* Torda, Clara, and Wolff, Harold G. (*Cornell Univ. Med. Coll., New York, N.Y.*). [*J. Pharmacol.*, **89**, 320–4 (1947).]

The synthesis of acetylcholine by frog brain or mouse brain *in vitro* under either aerobic or anaerobic conditions was markedly diminished by very small amounts of toxins of *Cl. botulinum* types A and B. The responsiveness of frog rectus abdominis muscle to acetylcholine was not modified by low concentrations of the toxins (1–100 mouse LD_{50} per 100 c.c.) and was moderately increased by high concentrations of the toxins (10,000 LD_{50} per 100 c.c.). It appears that decreased acetylcholine synthesis, as far as it is related to myoneural function, is mainly responsible for the " functional paralysis " observed in animals affected by the toxins of *Cl. botulinum*. L. E. GILSON (Chem. Abstr.).

Effect of BAL on Pyruvate Oxidation in Pigeon-brain Dispersions. Whittacker, V. P. (*Dept. Biochem., Oxford*). [*Biochem. J.*, **41**, 52 (1947).]

Low concentrations of BAL (0·5 mm.) cause an increase in the O uptake, in the presence of pyruvate, by pigeon-brain dispersions. This is due to a stimulation of the pyruvate oxidase system. S. MORGULIS (Chem. Abstr.).

Effect of Frontal Lobectomy on Blood Sugars of Normal Cats and Monkeys and Adrenal Denervated Cats. Kennard, Margaret A., Hampel, C. W., and Willner, M. Dorrit (*New York Univ. Coll. of Med., New York, N.Y.*). [*Am. J. Physiol.*, **149**, 246–53 (1947).]

In cats in which sham rage is produced by bilateral lobectomy, the blood-sugar level under dial or nembutal anesthesia is increased within half an hour following frontal lobectomy, and may continue raised for at least four to five hours thereafter. No such rise in blood sugar occurs in cats which are anesthetized with barbiturates without frontal lobectomy. Bilateral removal of an amount of occipital lobe approximately equal to that of bilateral frontal lobectomy causes no such rise in blood sugar. There is an accompanying rise of pulse and respiratory rate when blood sugar rises. Previous adrenal denervation causes the blood-sugar rise which appears after frontal lobectomy to fall within three to four hours. No rise in blood pressure occurs after frontal lobectomy, although blood sugar, pulse, and respiration increase. In monkeys, which do not develop sham rage after cortical ablations, there is no change in blood sugar, pulse, respiration or blood pressure after bilateral frontal or occipital lobe ablation.

E. D. WALTER (Chem. Abstr.).

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The Antagonism of Nicotinamide and Histamine on Isolated Organs with Smooth Muscles. Halpern, B. N., and Dainow, I. [*Z. Vitaminforsch.*, **15**, 260–7 (1944).]

An antagonism between nicotinamide and histamine could be demonstrated on the isolated intestine and the uterus of guinea-pig. The necessary doses of nicotinamide were the same as those of certain amino acids arginine, histidine, cysteine and are much greater than those of antergan. Nicotinamide diminishes the stimulant effect of acetylcholine and of $BaCl_2$ on the isolated intestine, but it seems without effect on the uterine contraction produced by posterior pituitary extract. The specificity and mechanism of the antihistaminic activity are discussed. LEOPOLD SCHEFLAN (Chem. Abstr.).

Experimental Studies of a New Pharmacodynamic Property of Nicotinamide. Antagonistic Action to Certain Effects of Histamine. Halpern, B. N., and Daino, I. [*Z. Vitaminforsch.*, **15**, 250–9 (1944).]

An antagonistic action of nicotinamide against the asthma produced by the inhalation of aerosols of histamine was demonstrated. This action is of specific nature against histamine and cannot be produced against the bronchospasm of acetylcholine. LEOPOLD SCHEFLAN (Chem. Abstr.).

Role of Adrenaline in Recovery of Inhibited Conditioned Reactions. Gellhorn, Ernst (Univ. of Minnesota, Minneapolis). [*Proc. Soc. Exptl. Biol. Med.*, **64**, 375–7 (1947); *cf. C. A.*, **39**, 4150⁹.]

Conditioned reactions which have been inhibited by lack of reinforcement in rats can be restored by insulin coma in normal and in adrenodemedullated rats. Apparently a secretion of adrenaline which is observed under conditions of insulin coma and electro-shock does not play a part in the mechanism of restoration of inhibited conditioned reactions. Restoration is not effected in normal rats by injection of insulin. It appears that the restitution of inhibited conditioned reactions is linked up with a hypothalamic-cortical discharge and not due to the liberation of adrenaline which invariably accompanies the excitation of hypothalamic centers under conditions of insulin coma and electroshock.

L. E. GILSON (Chem. Abstr.).

Role of Adrenalin in Recovery of Inhibited Conditioned Reactions. Gellhorn, E. [*Proc. Soc. exp. Biol., N.Y.*, **64**, 375–77 (1947).]

Two series of experiments, using 6 rats as subjects, were performed in order to determine whether increased adrenalin secretion or hypothalamic-cortical effects were responsible for the reappearance of an inhibited conditioned escape response consequent to insulin coma and electrically induced convulsions. Results indicate that (1) restoration of unreinforced conditioned responses after coma or electroshock, occurs in adreno-medullated as well as in normal rats; (2) injections of adrenalin alone fail to restore these responses. The results are discussed theoretically and are related to the problem of efficacy of shock therapy in schizophrenia.

L. A. PENNINGTON (Psychol. Abstr.).

The Influence of Extracortical Factors on the Function of the Central Nervous System. Orbeli, L. [*Amer. Rev. Soviet Med.*, **4**, 206–211 (1947).]

This is a review article presented to the Academy of Sciences, U.S.S.R., 16 May, 1940, which briefly describes the results of experiments performed at the Pavlov Institute. Among the extracortical factors discussed are the effects of castration, removal of the cervical and other sympathetic ganglia, damage to the thyroid, hypophysis, suprarenal and parathyroid glands, and destruction of the hypothalamus and cerebellum. As measured by conditioned reflex techniques these extracortical traumata produce "a weakened function of the cerebral cortex and a disturbance in equilibrium with increase of inhibition. The increased inhibition is relative and follows a weakening of stimulation."

L. C. MEAD (Psychol. Abstr.).

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Action of Thiamine Applied Directly to the Cerebral Cortex. *Dias, M. V.* [*Science*, **105**, 211–13 (1947).]

Small filter paper squares, soaked with thiamine hydrochloride in solutions of 1, 2, 5 and 10 per cent., were directly applied to one of the " motor " points in dogs which were craniectomized and a small region of the cortical " motor " area of one side exposed. Rhythmic muscular contractions occurred in the muscle or muscle group corresponding to the cortical " motor " point stimulated. A second application aroused stronger contractions which increased in intensity and frequency. Peripheral stimulation facilitated the response and lead to responses exhibiting the characteristics of localized convulsive reactions. In 34 of the 45 dogs used epileptiform convulsions were obtained with solutions of 2 to 10 per cent. In the remaining 11 dogs only localized muscular clonic reactions were obtained.

F. A. MOTE (Psychol. Abstr.).

A Simplified Encephalophone. *Conrad, Matthew, and Pacella, B. L.* [*Science*, **105**, 216 (1947).]

This article gives a wiring diagram and describes the action of a simple adapter which converts the low frequency varying voltages obtained with an electroencephalograph into variations in the pitch of an audible tone.

F. A. MOTE (Psychol. Abstr.).

Electroencephalography and Ophthalmology. *Callahan, A., and Redlich, F. C.* [*Amer. J. Ophthal.*, **29**, 1522–33 (1946).]

Recordings of electrical eye potentials following eye movements observed only when the retina is present, are believed to be due to corneo-retinal potential differences. Opening and closing the eyes in the dark and in the light produce similar changes in the occipital rhythm. There was no characteristic finding in amblyopia *ex* anopsia. The effect of opening the eye on the normal occipital rhythm does not differentiate true from malingered or hysterical blindness. Galvanic skin responses recorded on stimulation of a seeing eye can be used to differentiate blind from seeing eyes, thus identifying malingered blindness.

D. J. SHAAD (Psychol. Abstr.).

Frequency Analysis of Electroencephalograms. *Gibbs, F. A.* [*Science*, **105**, 132–34 (1947).]

The inadequacies of existing types of electroencephalogram frequency analyzers are pointed out; for example, frequency analyses are not satisfactory for clinical purposes. Furthermore, the phase component of wave form is not adequately revealed by frequency analysis. The electroencephalogram is a large, detailed, and complicated picture, which fairly easily yields to visual analysis and interpretation; the task for a machine is almost impossible. Improvements in electroencephalography will come when more attention is given to the selection and training of electroencephalographers and to the taking of easily interpreted, undistorted, and artifact-free records. F. A. MOTE (Psychol. Abstr.).

A New Type of Electroencephalographic Electrode Co-ordinator with Semipermanent Electrodes. *Buffington, M. A., and Weil, A. A.* [*Science*, **105**, 185–6 (1947).]

Described is an electrode wire and a unit for holding up to 18 wires in such a position that the greatest part of the weight of the wires is borne by the holding unit, thereby allowing the subject considerable freedom of movement. The region of attachment of electrode and wire is covered by acetone resisting tape. This type apparatus has been found to have long life, to segregate the electrodes, to produce few artifacts, and to give the operator a clear view of the subject's head during the recording. F. A. MOTE (Psychol. Abstr.).

A Contribution to the Question of Restriction of the Visual Field Due to the Diencephalon. *Knapp, P., and Schwarzmann, A.* [*Ophthalmologica*, **111**, 270–8 (1946).]

That there exists a direct connection of the optic chiasma with the midbrain has been known for some time. Eugen Frey clearly demonstrated in animals and man that fibers separating themselves from the dorsal part of the chiasm run with

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or without crossing to the median section of the tuber cinereum. The physiological significance of a direct connection between chiasm and midbrain was first demonstrated by W. R. Hess, who produced a left-side diathermic coagulation in the midbrain, leaving the optic nerves completely intact, after which there appeared a right-sided hemianopsia. With a diathermic coagulation produced on both sides of the midbrain the animal appeared to be blind, ran into a wall or ran beyond the edge of the table. The present authors cite as further evidence of the connection of the midbrain with restriction of the visual field a case of a woman patient of theirs who began to suffer from concentric narrowing of the visual field, hyperthyroidism, secondary amenorrhea, migraine, collapse, and cyanosis of the extremities. They are convinced that this non-hysterical restriction of the visual field is due to disturbance of the hypophysial-midbrain system which has long been known as seat of hormonal as well as vasomotor functions.

F. C. SUMNER (Psychol. Abstr.).

The Fine Structure and Topochemistry of the Nucleus of the Neurones. Sosa, Julio María (Inst. de Investigación de Ciencias Biólogicao, Montevidea, Uruguay). [*Anales facultad med. Montevideo*, **30**, 319–40 (1945).]

With basic aniline, Ag, and Feulgen-Rossenbeck's nuclein staining techniques, determination was made of the organization of and nuclein in the nucleus of the argyrophilic spherules in the nucleolus of the large nerve cells (pyramidal, Purkinje, mitral and anterior horn multipolar) of the central nervous system of chickens, pigeons, cats, rats, guinea-pigs, mice and man, both adult and embryo. The dispersion of the argyrophilic spherules in a reticular network or agglutinated as spheroid masses was a reflection of the metabolic activity of the cells. Failure to demonstrate nuclein in the nucleolus indicated that the spherules could not be elementary chromosomes as proposed by Cajal.

GEORGE K. DAVIS (Chem. Abstr.).

Phosphorus Metabolism in Active and Inactive Nerves. Bucher, Karl (Univ. California, Berkeley). [*Proc. Soc. Exptl. Biol. Med.*, **65**, 24–6 (1947).]

No difference was found by means of radioactive P^{32} in the P metabolism of stimulated and unstimulated rabbit nerves. L. E. GILSON (Chem. Abstr.).

Effect of Electrically Induced Convulsions on Rate of Alcohol Metabolism in Man. Newman, Henry W., and Yee, James (Stanford Univ. Med. School, San Francisco, Calif.). [*Proc. Soc. Exptl. Biol. Med.*, **65**, 122–3 (1947).]

The convulsions had no influence on the rate of disappearance of EtOH from the circulating blood. L. E. GILSON (Chem. Abstr.).

Analysis of the Effect of Barium upon Nerve with Particular Reference to Rhythmic Activity. Lorente de No, R., and Feng, T. P. (Rockefeller Inst., New York, N.Y.). [*J. Cellular Comp.* [*Physiol.*, **28**, 397–464 (1946).]

Over the range 0·0037–0·043 M Ba ions have a depolarizing effect on frog nerve. The rate of establishment and magnitude of the demarcation potential between the treated segment and untreated nerve increases with increasing Ba ion concentration and reaches a value of 8–10 mv. after 300–400 minutes. In 95 per cent. O_2–5 per cent. CO_2 hyperpolarization often precedes the depolarization that takes place to a smaller extent than in O_2. In N_2 Ba reduces the rate of anoxic depolarization. The reversible stage of conduction block by Ba can be relieved by an applied anodal current and is reinforced by cathodal polarization and rhythmic activity. A concentration of Ba causing severe block in a nerve in O_2 may cause irreversible block in an atmosphere of 95 per cent. O_2–5 per cent CO_2. Myelinated fibers are more susceptible to Ba than unmyelinated fibers. Ba-treated nerve displays spontaneous slow potential oscillations with periods of approximately 1 minute and amplitudes of 0·05–0·1 mv. H. L. MASON (Chem. Abstr.).

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Effect of Brain Metabolites on the Secretion of Gastric Glands. Gerchikova, K. A. [*Byull. Eksptl. Biol. Med.*, **21**, *No.* 5, 44–7 (1946).]

The experimental results show the antagonistic action of brain metabolites on the secretion of gastric glands depending on whether they are introduced suboccipitally or in the general circulation. Brain metabolites introduced suboccipitally lower the secretion of gastric glands and introduced in the blood increase this secretion. The mechanism of this antagonistic action is not yet known and is the subject of further study. W. R. EICHLER (Chem. Abstr.).

Autonomous Nervous System in the Regulation of Water-mineral Metabolism. Blokhin, N. N., and Pravdina, K. I. [*Byull. Eksptl. Biol. Med.*, **21**, *No.* 5, 26–8 (1946).]

Suboccipital injection of K and Na salts reacts on the autonomous nervous system and increases the tonus of the individual systems. Injection of K phosphates causes retention of H_2O by muscle and brain tissue and greatly decreases recovery of the H_2O. When strong parabiotic agents like K phosphates are injected directly into the ventricle, temporary depression of the parasympathetic centers of parabiotic nature occurs, especially of the sympathetic nervous system. Inhibition of the H_2O metabolism by injection of K phosphate possibly is the result of increased production of pituitrin in the posterior hypophysis, caused by sharp stimulation of the tonus of the sympathetic nervous system.

W. R. EICHLER (Chem. Abstr.).

Disturbances of Metabolism Associated with Head Injuries. Pickles, Wilfred (*Rhode Island Hosp., Providence*). [*New Engl. J. Med.*, **236**, 858–62 (1947).]

Seven cases of disturbances in sugar, H_2O or fat metabolism were observed among 2,500 patients with head injuries: 1 had transient glucosuria and subsequent diabetes insipidus, 1 had temporarily resistant diabetes mellitus, 4 had symptoms of diabetes insipidus (in 3 cases responding to pitressin or pituitrin) and 1 had lipemia. Traumatic lesions of the hypothalamic region of the brain are suggested as a possible cause for such disturbances.

MARION HORN PESKIN (Chem. Abstr.).

The Protective Action of Sodium Diphenylhydantoinate against Convulsions Induced by Niketamide in White Mice. Granier-Doyeux, Marcel. [*Rev. sanidad y asistencia social* (*Venezuela*), **11**, 377–85 (1946).]

The convulsions induced in white mice by subcutaneous injection of 2 per cent. niketamide [" Coramine " (N,N-diethylnicotinamide)] solution can be prevented by oral administration of 0·2 per cent. solution of Na diphenylhydantoin (Na dilantin) 6 to 12 hours before the injection. This observation could serve as a basis of a biological method for evaluating anticonvulsive drugs.

H. H. SZMANT (Chem. Abstr.).

Investigations on the Passage of Tracer Phosphorus into the Nervous System, a Special Use of the Indicator Method. Roeder, F. (*Deut. Forschungsanstalt Psychiatrie, Munich*). [*Naturwissenschaften*, **33**, 111–18 (1946); *Chem. Zentr.*, **1**, 51–2 (1947).]

The central nervous system is composed not only anatomically but also chemically of various kinds of structural units. Within the individual regions there exist in part considerable differences in the Fe and vitamin contents, in the O consumption, etc. The isotope method was used to follow the passage of substances from the blood vessels into the neutral tissue and to study their different behaviour in the individual regions. Phosphates were chosen as the test substance, since they are very closely associated with the various processes of the metabolism of the brain. Radioactive P (P^{32}) was used mixed with inactive P as Mg $(NH_4)PO_4$. This was dissolved in 1N HCl and further diluted with physiological salt solution and then neutralized. The resulting physiologically indifferent solution was similar in composition to Ringer solution. The P was present as the PO_4 ion. Experiments were carried out on 15 dogs, 43 rabbits, and 47 guinea-pigs. The dogs received about 200 microcuries, according to their weight, and the smaller animals received correspondingly smaller amounts. The phosphate solution was injected intra-

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muscularly and in no case contained more than 1/30 of the animal's daily phosphate requirement. After a definite interval the animals were killed and the specific activity of individual tissue samples was obtained by determination of the ratio of radioactive P of total P. Total P was determined colorimetrically by the eikonogen method. The frequency with which electrons were emitted from P^{32} was measured by the use of the Geiger-Muller counter. The phosphate was precipitated as molybdophosphoric acid. The specific activity obtained for the central nervous system was very low as compared with that of other organs. The various regions of the brain and the nuclear region behaved very differently. The same values were obtained for identical brain sections taken from the right and left sides of the same animal. Special regions, as the tuber cinereum, showed peculiarities. There was a very pronounced transfer of the tracer phosphate into the peripheral nervous system and into the optic nerves. The influence of the blood content on the specific activation of the brain tissue was studied, as was also the relation between the tracer phosphate and the lipoids of the brain.

M. G. MOORE (Chem. Abstr.).

Influence of the Female Sex Hormone (Folliculin) on the Elaboration of Mediators of the Central Nervous System. Kakushkina, E. A., and Tatarko, T. (Timiriazev State Museum). [*Compt. rend. acad. sci. U.R.S.S.*, **55**, 267–9 (1947) (*in French*).]

The content of acetylcholine-like substances of the rat brain is not altered by the injection of folliculin; however, the activity of the esterase is greatly diminished thereby raising the acetylcholine coefficient. R. W. FLEMING (Chem. Abstr.).

So-called Popa's Cerebrostimuline. Hamanaka, Shinzo, and Kurome, Kitaro. [*Folia Endocrinol. Japon*, **19**, 381–97 (1943).]

The presence of cerebrostimuline, which accelerates the tissue respiration of the cortex, in mouse cerebrospinal fluid cannot be denied because the R.Q. of the cortex (determined by Warburg's method) tends to be slightly higher in cerebrospinal fluid than in the auto-serum. The cortical R.Q. is not affected by injection of Praehormone (anterior hypophysis preparation), but is markedly inhibited by elimination of KCl from the perfusion fluid, while the R.Q. of liver and kidney is unaffected by lack of KCl. Hence KCl seems to be functionally related to cerebrostimuline, if not its substitute. J. G. YOSHIOKA (Chem. Abstr.).

Effect of Insulin on the Nervous System. Glazov, V. A., and Petrov, F. P. (Skvortsov-Stepanov Hosp., Leningrad). [*Byull. Eksptl. Biol. Med.* (*U.S.S.R.*), **11**, 291–3 (1941).]

In frog sciatic-gastrocnemius preparations insulin produced a block of the parabiotic nature, removed by a direct current anode, and intensified by the cathode. Insulin applied directly to cut surface of spinal cord increased the latent period of the reflex. Adrenaline, under similar conditions, decreased the latent period and removed the insulin-induced block.

G. M. KOSOLAPOFF (Chem. Abstr.).

Changes in the Activity of Cholinesterase of Nervous Tissue under the Influence of Constant Current. Babsky, E. B., and Minaev, P. F. [*Nature, Lond.*, **158**, 343–4 (1946).]

By means of biological assay of the dorsal muscle of the leech and the m. rectus abdominis of the frog, it was found that " . . . in 90 per cent. of the experiments the activity of cholinesterase was definitely affected by polarization. . . . This influence of polarization upon the activity of cholinesterase was equally manifested in the cerebral cortex and in the nerve fibres. . . . The fact that the cathode of constant current lowers the activity of cholinesterase, while the anode produces the opposite effect, that is, increases the activity of this enzyme, may be explained on the basis of the changes that take place in the distribution of ions in the nerve under the influence of polarization."

A. C. HOFFMAN (Psychol. Abstr.).

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The Action of Some Alkaloids of Opium on Cholinesterase. Mihailesco, Vintila V. [*Bull. acad. med. Roumanie*, **18**, *No.* 1/3, 53–5 (1946).]

The rectus abdominis of a frog was suspended in 35 c.c. of oxygenated Ringer solution at room temperature and its contraction measured when 50γ of acetylcholine (I) was added. The smallest amount of serum which would hydrolyze the (I) in 5–10 minutes was determined, and it was shown that morphine sulfate (II), codeine phosphate (III), dionine-HCl (IV) and papaverine-HCl (V) in concentrations of 5 mgm./c.c. did not affect the muscle directly when alone or with serum. In concentrations of over 100γ/c.c., (II) inhibited the serum cholinesterase (VI), whereas (III) and (IV) inhibited it in concentrations of 10, 25, 50, 100 and 250γ/c.c. to an extent proportional to the concentration. In concentrations of 10, 25, 50, 100, 250 and 500γ/c.c., (V) inhibited the (VI). None of these alkaloids changed the pH of the serum. MARSHALL E. DEUTSCH (Chem. Abstr.).

The Role of Cholinesterase in the Action of Estrone on the Vegetative Nervous System. Mihailesco, Vintila V., and Radulesco, Maria. [*Bull. acad. med. Roumanie*, **18**, *No.* 1/3, 56–8 (1946).]

When used by a previously described technique (*cf.* preceding abstr.), estrone (as its benzoate) in concentrations greater than 25 units/c.c. is shown to inhibit cholinesterase. Thus it allows acetylcholine to be stored and improves capillary circulation. MARSHALL E. DEUTSCH (Chem. Abstr.).

Nerve Conduction after Inactivation of Choline Esterase. Boyarsky, L. L. [*Proc. Soc. exp. Biol., N.Y.*, **64**, 106–8 (1947).]

The sciatic nerve of the frog, "exposed to di-isopropyl fluorophosphate (DFP) in a concentration and for a time sufficient fully to inactivate its choline esterase, can still conduct impulses with entirely normal action potentials." It is concluded that choline esterase is not essential to nerve conduction. A brief review of the recent literature is given. L. A. PENNINGTON (Psychol. Abstr.).

Combined Action upon Muscle of Adenosine Triphosphate, Acetylcholine and Potassium, Calcium and Magnesium Ions. Babsky, E. B., and Minaev, P. F. [*Nature, Lond.*, **158**, 238 (1946).]

Work with the dorsal muscle of the leech and the m. rectus abdominis of the frog indicates that adenosine triphosphate, potassium and magnesium, but not calcium, increase the sensitivity of muscle to acetylcholine.
A. C. HOFFMAN (Psychol. Abstr.).

Experimental Antagonistic Action of Anterior Hyophysis Hormones and Acetylcholine on Cerebral Blood Vessels. Relation to Experimental Catalepsy. Baruk, H., David, M., Racine, M. Vallancien, and Borenstein, P. [*Compt. rend. soc. biol.*, **140**, 398–9 (1946).]

In adult male rabbits with the skull trepanned, the intravenous injection of a large dose of anterior hypophysis extract produced a decrease in cerebral vessel diameters, and brain volume, with resulting cataleptic symptoms. Injection of lethal or near lethal doses of acetylcholine caused enlargement of cerebral blood vessels, increase in brain volume and stupor. The two agents given together counteracted each other's effect. L. E. GILSON, (Chem. Abstr.).

Curative Effects of a Complex Choline Compound on the Impaired Metabolism of Choline-deficient Rats. Abdon, N. O., and Borglin, N. E. (*Univ. Lund.*). [*Nature*, **159**, 272–3 (1947).] ; *cf. C. A.*, **41**, 1296i.]

Addition of an acetone-precipitated fraction from extract of splenic tissue (I) (*C. A.*, **39**, 4902[8]) increases the metabolism of muscle tissue of choline-deficient rats to values approaching normal, but does not affect the metabolism of normal muscle tissue. (I) resembles acetylcholine precursor, being soluble in alcohol and H_2O, and insoluble in ether and petroleum ether. (I) is precipitated from aqueous solution by acetone and by Ba salts, but the activity cannot be regenerated from the Ba precipitates. (I) activity is destroyed by boiling in 2N HCl or in 1N NaOH for 15 minutes, but not by boiling at pH 4 for 30 minutes.
CARL C. SMITH (Chem. Abstr.).

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Relationships Between Anaphylactic Shock and Acetylcholine Shock. Yañez, Arsacio Peña, and Goñi, Pedro Marid (Facultad med. Cádiz). [*Rev. espan. fisiol.*, **1**, 232–7 (1945).]

Acetylcholine chloride (I) was administered to guinea-pigs in doses of 0·5–2 mgm./100 gm. intracardially. Shock was immediately manifested by convulsions, dyspnea, bradycardia, salivation, lachrimation and frequent defecation and micturition. Recovery took 8–10 minutes for animals not in a state of apnea. Intraperitoneal injection of vitamin B_1 sensitized the animals to (I) and made it possible to produce shock with smaller doses of it. The bradycardia and salivary and lachrimal hypersecretion were not characteristic of anaphylactic shock. Further differences were found in experiments with dogs. Anaphylactic shock was accompanied by an increased coagulation time and a leucopenia. Neither effect was shown by dogs in acetylcholine shock. It is concluded that the two types of shock do not have a common mechanism. MARSHALL E. DEUTSCH (Chem. Abstr.).

Thiamine and the Metabolism of Acetylcholine in the Central Nervous System. Egana, Enrique (Univ. Chile, Santiago, Chile). [*Pub. lab. med. exptl. clin. med. Prado-Tagle, Univ. Chile* (1), 127 pp. (1946).]

Acetylcholine was determined in the brain of the rat by using the anterior rectus abdominis muscle of *Caliptocephalus gayi* or of *Bufo chilensis*. Average values for normal and avitaminotic rats are: Whole brain 2·60 and 1·50γ; the cortex contained 2·8 and 1·4γ per gm., respectively; the gray matter 6·8 and 4·2γ per gm. The oxidation of choline by cholineoxidase, prepared preferably according to Mann and Quastel (*C. A.*, **31**, 7908[3]), was studied in the Warburg apparatus. Thiamine has no direct effect on the liver choline-oxidase system of normal and avitaminotic rats. Brain and cortex extracts of normal and avitaminotic animals cannot oxidize choline. Addition of the liver enzyme to cortex extracts increases notably their O consumption. In the absence of substrate, cortex, gray matter, and liver of normal animals form acetoacetate; the amount is less in avitaminotic liver and gray matter, but not in cortex. Presence of acetate decreases acetoacetate in normal gray matter, increases it in cortex, and has no effect in liver. In avitaminotic tissue, addition of B_1 decreases acetoacetate. Citrate decreases acetoacetate in gray matter and liver, possibly by blocking the respiration, while the values in the cortex are increased. B_1 indirectly increases acetoacetate. Pyruvate increases acetoacetate in normal cortex and liver, but decreases it in gray matter. Addition of B_1 causes a marked increase in gray matter and liver. Acetyl phosphate has no influence on acetoacetate formation in normal cortex and liver; addition of B_1 to avitaminotic tissues increases acetoacetate. In gray matter, acetyl phosphate decreases acetoacetate; addition of B_1 causes further decrease. In the brain of avitaminotic rats the activity of cholinesterase is decreased; addition of B_1 or of diphosphothiamine activate it. In the absence of substrate, normal and avitaminotic cortex synthesize acetylcholine to the same amount; avitaminotic gray matter synthesizes it better than normal tissue. Addition of B_1 brings acetylcholine to normal values. Pyruvate increases it, while citrate decreases it slightly. The cholinesterase content of different parts of the rat brain decreases in the following order: pineal gland, gray matter, cortex, cerebellum. In avitaminotic brains all values are slightly higher. *In vitro* B_1 and diphosphothiamine have no influence on cholinesterase; acetylcholine inhibits it in all organs studied. K. SCHOEN (Chem. Abstr.).

Further Proof of the Acetylcholinergic Action of Antigens. Danielopolu, D., and Popesco, Marin (Acad. Med., Bucharest, Roumania). [*Compt. rend. soc. biol.*, **140**, No. 9–10, 243–5 (1946); *cf. C. A.*, **39**, 2563[2, 6]; **41**, 2155d.]

As previously shown, all antigens (foreign serums, bacterial extracts, tuberculin, etc.), produce inhibition in all organs where the parasympathetic system is inhibitory. The cells in the presence of the antigen liberate acetylcholine (I). The effect is inhibited by atropine, which prevents the parasympathomimetic action of (I) and augmented by eserine and strophanthin, which inactivate cholinesterase (II). With isolated unsensitized rabbit intestine in Tyrode solution at 38° the addition of horse serum provokes contraction due to liberation of (I) from a precursor contained in the tissues. If the bath fluid is now changed and horse

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serum again added, no contraction occurs because the (I) precursor is exhausted. If the bath fluid is changed again and (I) is added, contraction occurs for a time and the (I) precursor is reformed in the tissues by hydrolysis of (I) by tissue (II) and conversion to precursor. If the bath fluid is now changed again and horse serum is added, contraction occurs again as in the first part of the experiment. This sequence of effects can be repeated several times with the same segment of intestine.

L. E. GILSON (Chem. Abstr.).

Acetylcholine and Adrenaline Shocks. Danielopolu, D. (Univ. Bucharest.). [*Bull. acad. med. Roumanie*, **13**, *No.* 1/2, 57–67 (1943); *cf. C. A.*, **40**, 6668[e].]

General acetylcholine shock is caused by production of acetylcholine (I) so rapidly that it passes into the blood directly instead of first being transformed into a complex. A similar mechanism can be used to explain the syndrome due to an excess of adrenaline or sympathin. The hyperproduction of (I) is always associated with or followed by the hyperproduction of adrenaline or sympathin and the inverse is also true. Proposed mechanisms are discussed.

MARSHALL E. DEUTSCH (Chem. Abstr.).

Acetylcholine Shock. Danielopolu, D. [*Acta Med. Scand.*, **126**, 595–601 (1947).]

Acetylcholine (ACh) shock is an acute condition characterized by hyperfunction of organs in which parasympathin (P) is the excitor and sympathin (S) the inhibitor, or by hypofunction of organs where P is the inhibitor and S the excitor. The symptoms include bradycardia, A-V block, hypotension, hypothermy, hypermotility of the digestive tract, uterus, or bladder, bronchial constriction, convulsions, leucopenia with mononucleosis and eosinophilia. The shock may be transitory or may end in death. It is associated with an increased production or with a decreased destruction of ACh. This type of shock can be provoked by intravenous injections of ACh. It can be prevented with atropine. In the atropinized animal ACh has a sympathomimetic action, causing hypertension. A similar shock can be provoked by stimulating the peripheral end of the vagus, whereby over-production of ACh is effected. Asthma is due to ACh shock. The disease is associated with a localized parasympathetic preponderance. Similarly, *sea sickness* is a generalized ACh shock caused reflexly through the vestibular organ and can be forestalled with atropine. ACh shock also can be produced by decreased destruction; for instance, by the aid of eserine, but this action is very complicated because of the adrenosecretory action of the eserine. Intoxication by digitalis or strophanthin is also due largely to ACh, since they inactivate cholinesterase. The protective mechanisms which the organism can release against ACh shock are discussed.

S. MORGULIS (Chem. Abstr.).

New Proofs of the Acetylcholine Nature of Paraphylactic (Anaphylactic) Shock Studied on Isolated Organs. Danielopolu, D. [*Acta Med. Scand.*, **126**, 589–94 (1947).]

According to D.'s conception, anaphylactic shock is due to the liberation of acetylcholine. The antigen produces two actions: A non-specific effect (paraphylaxis) common to all antigens and associated with liberation in the cells of acetylcholine, and a specific effect due to the particular antigen to which the cell responds with production of antibodies which are formed by a direct union with choline (antibody-choline) which imparts immunity or phylaxis. When a second dose of antigen is introduced, the antigen-antibody-alexin complex is formed and the choline is split off as acetylcholine, which provokes the paraphylactic shock. In experiments on the guinea-pig uterus this latter condition has been shown to occur. It has been further proved that the anti-paraphylactic phenomenon is due not merely to the complete loss of antibodies, but also to the exhaustion of choline in the tissues.

S. MORGULIS (Chem. Abstr.).

Effect of Acetylcholine on the Isolated Spinal Cord of the Frog. Kirillova, A. A. [*Bull. biol. med. exptl. U.R.S.S.*, **16**, *No.* 7/8, 53–6 (1943); *Am. Rev. Soviet Med.*, **4**, 269 (1947).]

With the spinal cord kept in Ringer solution containing 1 : 300,000 of eserine, concentrations of 2×10^{-8}–1×10^{-6} acetylcholine were added to the renewed solution after the threshold of reflex irritability was established; 10^{-6} reduced the

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irritability markedly, whereas concentrations of 10^{-7} had either a stimulating or an inhibitory effect; lower concentrations increased the irritability. In graphic recording of spinal cord reflexes concentrations of 10^{-6} resulted either in the disappearance of reflex muscle contractions or in their rapid decline, whereas 5×10^{-5} and $3{\cdot}3 \times 10^{-8}$ stimulated the reflexes of the opposite calf muscles. In high concentrations, acetylcholine depressed the isolated spinal cord of the frog, while low concentrations increased reflex reactions. No contraction of muscles connected with nerve centers was observed. This contradicts the role of acetylcholine as an agent transmitting the impulses via the nerve centers; the action of acetylcholine consists in the release or depression of reflex reactions.

W. R. HENN (Chem. Abstr.).

The Acetylcholinergic Action of Antigens and the Acetylcholinic Nature of Paraphylactic (Anaphylactic) Shock. Nicolau, C. T., and Cristesco, N. (First Med. Clinic, Bucharest). [*Bull. acad. med. Roumanie*, **17**, *No.* 4/6, 10–17 (1945).

Intravenous injection, in human subjects, of horse serum antigonococcus vaccine and acetylcholine produced leucopenia and increased eosinophiles and monocytes. The effects on pulse rate and blood pressure varied somewhat. The results confirm Danielopolu's conclusions (*C. A.*, **39**, 2563[2]) concerning the acetylcholinergic action of antigens and the acetylcholine nature of paraphylactic shock.

MARSHALL E. DEUTSCH (Chem. Abstr.).

Shock and Ovarian Acetylcholinogenesis. The Acetylcholinergic Function of the Follicular Hormone. Crainicianu, Al. [*Bull. acad. med. Roumanie*, **17**, 133–40 (1945) (*in French*).]

A theory of the mechanism of the cardiovascular action of folliculin (I) is presented. Injections of (I) cause the liberation by the ovaries of a considerable quantity of acetylcholine which passes into the blood and causes hypotension and shock. This theory explains the fact that (I) causes hypotension only in the case of the female and then only if the ovaries are not destroyed or removed.

H. H. SZMANT (Chem. Abstr.).

Effect of Adenosine Triphosphate on Muscular Sensitivity to Choline and Acetylcholine. Minaev, P. F. [*Byull. Exptl. Biol. Med.*, **21**, *No.* 5, 37–40 (1946).

Choline acetylase (*C. A.*, **40**, 7258[7]) from nervous tissue was found active in the presence of adenosine triphosphate. The latter sensitized muscle to acetylcholine. Immersion of muscle tissue in adenosine triphosphate alone did not show a marked effect. However, after washing the adenosine triphosphate from the muscle and immersing in choline marked sensitivity was observed which increased on repetition of washing and immersion. Simultaneous action of the two solutions further increased the sensitivity of muscle. It is, therefore, concluded that the action of adenosine triphosphate is caused by formation of acetylcholine in the muscle itself. The effect may be due to inactivation of cholinesterase present in nervous tissue, since it is known that the anticholinesterase agents, eserine and prostigmine, increase the sensitivity of muscle to acetylcholine. Experiments are being continued.

W. R. E. (Chem. Abstr.).

Mechanism of the Strengthening Action of Parasympathomimetic Drugs on the Effect of Acetylcholine. Koiwaya, Osamu. [*Folia Pharm. Japon.*, **39**, 116–33 (1943).]

The dilatation of the auricular vein of a perfused rabbit ear by acetylcholine is strengthened by an addition of rabbit serum or pretreatment with eserine or prostigmine, but not so markedly with pilocarpine. The depression of rabbit blood pressure by acetylcholine is strengthened for a long time when the animal has been pretreated with eserine or prostigmine, but not with pilocarpine. The excitation of rabbit intestine is strengthened by eserine or prostigmine, which itself has no such action. Pilocarpine is synergistic with acetylcholine in its action on the perfused intestines. The contraction of frog dorsal muscle by acetylcholine is markedly strengthened by pretreatment with eserine, prostigmine, or pilocarpine which, however, is not synergistic when acetylcholine is given first. Eserine and pilocarpine are slightly synergistic in this action. The excitation of frog dorsal muscle

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by Ba is strengthened by pretreatment with eserine, prostigmine, or pilocarpine. Acetylcholine is synergistic when given simultaneously, but not when given first. The depressing action of acetylcholine on a perfused frog heart is counteracted or weakened by the extract from the rabbit blood or intestines and also from the frog dorsal muscle owing to the presence of cholinesterase in the tissues. Eserine and prostigmine in a small amount inhibit cholinesterase activity, but pilocarpine does not. All three, however, heighten the inhibition of frog heart induced by electric stimulation of the vagus nerve and markedly excite the frog orbicularis oculi and the parasympathetic peripheral nerve endings. The tonic action of acetylcholine on the perfused frog dorsal muscle and rabbit blood vessels and intestines is strengthened by all three, but that on rabbit blood vessels and heart *in situ* is heightened only by eserine and prostigmine. Here the synergistic effect in the former case is due to the inhibition of cholinesterase action and in the latter more likely to excitation of the parasympathetic nerve endings.

J. G. Yoshioka (Chem. Abstr.).

Effect of Direct Current Anode on the Acetylcholine Content of the Brain. *Raspopova, N. A.* (*State Pedagog Inst., Moscow*). [*Byull. Eksptl. Biol. Med.* (*U.S.S.R.*), **11**, 238–40 (1941).]

In cat (or dog) experiments, electrodes were placed on the exposed cortex of the two hemispheres and a third electrode was placed on neck muscle. The " brain " electrodes were run as cathodes for 10 minutes, then one was disconnected and the other two hemispheres in eserinized Ringer solution were tested for acetylcholine. " Anode " application immediately after " cathode " application led to a drop in acetylcholine level ; this is explained either by repression of its formation or by acceleration of its hydrolysis. G. M. Kosolapoff (Chem. Abstr.).

Comparative Study of the Acetylcholine Content of Vertebrate Nerves. *Filippova, A. G., and Korenebskya, O. G.* (*State Pedadog. Inst., Moscow*). [*Byull. Eksptl. Biol. Med.* (*U.S.S.R.*), **11**, 234–7 (1941).]

Dissected nerve tissues of Anodonta and of frogs, cats and dogs, were macerated in eserinized Ringer solution, and the extract tested on leech muscle. Generally the invertebrate's nerve was found to have more acetylcholine than the vertebrate nerve. The average values were : Anodonta 3·3–6·6γ/gm. ; frog 1·3–2·5 ; dog 0·45–0·9. A possibility exists of the presence of an unknown sensitizer in the Anodonta nerve extract. G. M. Kosolapoff (Chem. Abstr.).

Action of Acetylcholine on Chronaxie and Speed of Conduction of Frog Nerves. *Sozer, F., and Winterstein, H.* (*Univ. of Istanbul, Turkey*). [*Arch. intern. pharmacodynamie*, **73**, 159–77 (1946).] *Cf. following abstract.*

Concentrations of 10^{-3} to 10^{-6} acetylcholine have no effect on the rheobase. A concentration of 10^{-3} increases chronaxie, 10^{-4} decreases it, and 10^{-5} increases it again. Thiamine in concentrations of 10^{-4} to 10^{-6} increases chronaxie. The excitability of degenerated nerves is not restored by acetylcholine. The effect of different concentrations of acetylcholine on the speeed of conduction is such that speed is increased when chronaxie is decreased and *vice versa*.

M. L. C. Bernheim (Chem. Abstr.).

Action of Acetylcholine on Reflex Time. *Sozer, F., and Winterstein, H* (*Univ. Istanbul, Turkey*). [*Arch. intern. pharmacodynamie*, **73**, 294–8 (1946).] *Cf. preceding abstract.*

Intraperitoneal injection of 1·0 ml. of 10^{-3} acetylcholine into the frog prolongs the flexor reflex time. M. L. C. Bernheim (Chem. Abstr.).

Analysis of the Functional Role of Acetylcholine in Electrotonus of the Central Nervous System. *Markosyan, A. A., and Rachkovoi, G. I.* (*Lenin Pedagogical Inst., Moscow.*)

Experiments were performed with spinal frogs employing non-polarizable electrodes using the latent period of the flexion reflex of the leg as indicator of change in central excitability. Eserine, prostigmine, and atropine were applied locally to the spinal cord. It was found that an ascending current increased the

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latent period while a descending current decreased it. Eserine and prostigmine caused the anelectrotonic prolongation of reflex time to disappear, while further enhancing the catelectrotonic decrease. In several experiments after eserinization a sharp increase in latent period was observed on applying the descending current. Atropine produced a complete disappearance of the changes in latent period produced by anelectrotonus or catalectrotonus. The observations are related to possible changes in acetylcholine concentration under the electrodes.

EUGENE ROBERTS (Chem. Abstr.).

Effect of Calcium Ions on the Formation of Acetylcholine in the Central Nervous System and the Nerve "Trunks." Pugachev, A. G. (State Pedagog. Inst., Moscow). [*Byull. Eksptl. Med. Biol. (U.S.S.R.)*, **11**, 241–3 (1941).]

In experiments on dogs and cats, filter papers saturated with 1–2 per cent. $CaCl_2$ solution were applied locally. In the cortex experiments in most cases the acetylcholine level was significantly depressed (smaller number indicated no change or increase). Sciatic nerve experiments gave similar results, but the decrease of acetylcholine was generally less pronounced.

G. M. KOSOLAPOFF (Chem. Abstr.).

2. Pharmacology, Treatment and Psychiatry.

Experimental Study of Chronic Alcoholism. Mezey, K. [*Anales soc. Biol. Bogota*, **1**, 18 (1946).]

In frogs which had been treated with EtOH for 3–5 months the fat content of brain, liver, kidneys and striated muscles was increased by 39–67 per cent., while N content diminished. The liver lost 90 per cent. of its glycogen. Also the total fat in the brain of frogs and rabbits was increased by 24 per cent. Conclusions: Tolerance to alcohol is due to a change in its distribution in the various organs. This probably explains the altered reaction of the alcoholic toward anaesthetics.

F. FROMM (Chem. Abstr.).

Ocular Psychoneuroses. Davenport, R. C. [*Trans. Ophthal. Soc. U.K.*, **64**, 24 (1944).]

Eye complaints may be roughly divided into those with an obvious organic state to cover the symptoms, those where there is present an incontrovertible organic lesion upon which is overlaid the element of neurosis, and those with quite inadequate organic grounds. Crucial for the recognition of psychoneurotic overlay as well as the more defined psychoneuroses are: (1) An appreciation of the personality make-up of the individual meeting the stresses of life; (2) absence of organic state to cover the symptoms after careful examination; (3) relief of symptoms with insignificant correction or persistent complaint despite every possible correction of organic difficulty; (4) ascertainment of what the patient has to gain from the eye complaint.

F. C. SUMNER (Psychol. Abstr.).

Ocular Psychoneuroses. Doggart, J. H. [*Trans. Ophthal. Soc. U.K.*, **64**, 29 (1944).]

Certain elements in the case history, such as the patient's attitude toward his occupation, emotional tension, fantastic symptoms, or suggestibility can lend support to a diagnosis of ocular psychoneurosis. During the examination the hesitant answering of questions, inconsistent performance on the ocular test, perplexity in the Maddox rod test and in the Bishop Harman diaphragm test, frequent blinking, flinching, squeezing together of eyelids, and absence of any organic handicap are features of the ocular psychoneurotic. Difficulty in a differential diagnosis between malingering and psychoneurotic inhibition is encountered only at the borderline. Mirror cases may be helped by joint discussion between patient and the ophthalmic surgeon or by prescribing glasses of small refraction error and having nothing to do with the so-called eyestrain; serious cases should have psychiatric treatment.

F. C. SUMNER (Psychol. Abstr.).

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The Two Phases of the Hypertension Produced by Acetylcholine after Atropine. Danielopolu, D. [*C. R. Soc. Biol.*, **140**, 298 (1946).]

ACh (I) provokes a parasympathomimetic cellular response, causing liberation of sympathin, which produces a sympathomimetic effect. These two phenomena together produce an amphomimetic effect on the terminal organ, atropine has a parasympathetic-inhibiting action and prevents the parasympathomimetic response. After atropine I produces vasoconstriction. This is the first phase of the production of hypertension. The atropine inhibits the action of cholinesterase, and since the I is not immediately destroyed, it stimulates the adrenal medulla to liberate adrenaline, thus producing a further increase in blood pressure. This is the second phase and is abolished by adrenalectomy.

L. E. GILSON (Chem. Abstr.).

Cardiac Action and Psychiatric Uses of Chinese Schisandra. Siversev, I. I. (*Kazakh Med. Inst. V. M. Molotov, Alma-Ata*). [*Farmakol. i Toksikol.*, **9**, *No.* 4, 10–12 (1946).]

Extracts (0·02 and 0·04 per cent.) of Schisandra leaf (I) mildly intensify systole in healthy isolated frog heart in some but not all tests. In the most active cases (I) increases the minimum volume of relaxed, hypodynamic frog heart. Thus, after perfusion with papaverine-HCl solution (1 : 20,000), then for two hours with Ringer solution and finally with 0·04 per cent. extract of (I), minimum volume rose 56 per cent. in a frog heart isolated by the Gramenitskii method. Extracts of (I) also have favourable effects on mental patients in depressive states, as indicated by clinical trials with 37 patients (15 exogenic and 22 endogenic), each receiving one tablespoon of 1 per cent. extract of (I) three or four times daily.

JULIAN F. SMITH (Chem. Abstr.).

The Lack of Cerebral Effects of d-Tubocurarine. Smith, Scott M., Brown, Hugh O., Toman, James E. P., and Goodman, Louis S. (*Univ. of Utah School of Med., Salt Lake City*). [*Anesthesiology*, **8**, 1–14 (1947).]

A dose of d-tubocurarine chloride (I) 2·5 times that necessary for complete respiratory paralysis and adequate for complete skeletal muscular paralysis was given intravenously over a period of 33 minutes to a healthy trained adult observer not undergoing operation. Inasmuch as no changes occurred in the electroencephalogram, consciousness, and sensorium, or in any aspect of higher central nervous system function, it is concluded that (I) has no significant central stimulant, depressant or analgesic action. Attention is called to the importance of this observation for the proper use of curare as an adjuvant in anesthesia.

RUTH BERRGREN (Chem. Abstr.).

Cell Pharmacodynamics. I. Mode of Action of Medicinal Substances. Variations in Cell Respiration in Certain Tissues Under the Influence of Some Drugs. Levy, Jeanne (*Univ. Paris*). [*Bull. soc. chim. biol.*, **28**, 328–32 (1946).]

Preliminary Discussion. II. Respiration of Cerebral Cortex Cells Under the Influence of Associated Hypnotic Drugs. Buchel-Olszycka, L. [*Ibid.*, 333–8.]

EtOH and chloral hydrate together exert a greater inhibiting influence on the O consumption of rat cerebral cortex slices than the calculated sum of their individual effects.

III. Respiration of Cerebral Cortex Cells Under the Influence of Caffeine, Eserine, Ephedrine and Benzedrine. Levy, Jeanne. [*Ibid.*, 338–41.]

Caffeine and eserine increase the O consumption of rat-brain slices. Ephedrine and benzedrine in any concentration have an inhibiting action. Na camphosulfonate slightly increases O consumption, although it is not supposed to act on the central nervous system.

L. E. GILSON (Chem. Abstr.).

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Curare—Procurement and Pharmacology of the Dimethyl Ether of Methyl Bebeerine. Brazil, Oswaldo V, Seba, Roched A., and Campos, Joao S. (Inst. Vital Brazil Niteroi). [*Bol. Inst. Vital Brazil*, **5**, 79–96 (1945) (*with English summary*).]

Bebeerine dimethyl ether methyl chloride has a physiological action similar to that of curare. It was prepared by the methylation of purified extracts from the root of *Chondrodendron platyphyllum*. Crystal bebeerine (50 gm.) m. 213–14° from the root of *C. platyphyllum* was heated three hours over a water bath with 500 c.c. of CH_3OH, 15 gm. of Na methylate, and 130 gm. of Mel. The material was cooled till the following day, at which time a cream-coloured substance, which was the iodide of the monomethyl and dimethyl ethers of bebeerine precipitated. Pb chloride (30 gm.) was added, and the material was filtered and twice recrystallized from methanol. The iodide crystals of the dimethyl ether of methylbebeerine thus obtained were prismatic m. 257°. The iodide was converted to the chloride by treatment with an excess of AgCl. The chloride crystallized in bundles of fine needles. The authors conclude that the Me derivations of bebeerine and tubocurarine are isomers. The chloride of the methyl ether of methylbebeerine had greater biological activity than the simple chloride of the bebeerine, the fatal dose of the former when injected intravenously being 0·01 mgm. per mouse (*Drymomys musculos* Natt.) weighing 18–20 gm. and the fatal dose of the latter being 2 mgm. The dose of the methyl ether of methylbebeerine necessary to paralyse the forefeet of the mice was 0·0025 mgm., and to paralyze both pairs of feet required 0·005 mgm. The dose of the chloride of bebeerine needed to paralyze the forefeet was 1 mgm. and that necessary to paralyze both pairs of feet was 2 mgm.; this amount was also the fatal dose. Both drugs caused exophthalmos. Death was preceded by paralysis of the diaphragm. Similar results were obtained on rats, rabbits, dogs, pigeons and frogs (*Leptodactylus ocellatus*). Bebeerine derivations given orally were inactive. They were excreted unchanged in the urine when injected. They did not lower blood pressure in dogs and by implication would not in other species. Dogs receiving 2·5 times the fatal dose could be kept alive by artificial respiration. These experiments show that the fatal effects of bebeerine derivations were due to paralysis of the diaphragm. Bebeerine derivations showed antagonism to prostigmine in the pigeon. Tetanus produced from tetanus toxin in rabbits could be removed by bebeerine derivations. Frogs were unusually resistant to bebeerine, but its action can be demonstrated by injection into the ventral lymphatic sac. Sensitivity to bebeerine derivations differed with different species.

NELLIE M. PAYNE (Chem. Abstr.).

Effect of Cyanide on the Concentration of Lactate and Phosphates in Brain. Olsen, Norman S., and Klein, J. Raymond (Univ. of Illinois, Coll. Med. Chicago). [*J. Biol. Chem.*, **167**, 739–46 (1947); *cf. Albaum et al., C. A.*, **40**, 6164².]

The concentration of lactic acid in brain increases after intravenous administration of subconvulsant, convulsant and fatal doses of cyanide. After administration of the two latter doses, the concentration of phosphocreatine decreases. The changes evoked by the convulsant dose and presumably the subconvulsant, are reversible. The changes are attributable to direct action of cyanide upon brain.

LEONARD KRAEL (Chem. Abstr.).

Effect of Insulin Hypoglucemia and Glucose on Various Amino Acids in Blood of Mental Patients. Harris, Meyer M., and Harris, Ruth S. (New York State Psychiatric Inst. and Hosp., New York, N.Y.) [*Proc. Soc. Exptl. Biol. Med.*, **64**, 471–6 (1947); *cf. C. A.*, **37**, 6725⁴.]

The level in the blood of all the amino acids investigated decreased to a variable extent during insulin hypoglucemia and also after glucose administration. Differences in the behaviour of the individual amino acids under such conditions are discussed.

L. E. GILSON (Chem. Abstr.).

Antiacetylcholine and Antihistamine Action of Cocaine, Procaine and Percaine. Studies with Aerosols and with Isolated Guinea-pig Intestine. Frommel, E., Favre, M., and Vallette, F. (Faculty of Med. of Geneva, Switz.). [*Arch. intern. pharmacodynamie*, **73**, 355–66 (1947).]

The local anesthetics protect guinea-pigs exposed to aerosols of histamine or acetylcholine, and *in vitro* inhibit their action on the ileum.

M. L. C. BERNHEIM (Chem. Abstr.).

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Pharmacodynamics of Cerebral Vessels. I. Action of Adrenaline. Popesco, Marin (Univ. Bucharest, Roumania). [*Bull. acad. med. Roumanie*, **17**, 10–20 (1945) (*in French*).]

Simultaneous records of systemic and cerebral (central end of internal carotid) pressures (Huerthle's method) in dogs indicated that cerebral vessels are more sensitive than systemic to vasoconstrictor action of adrenaline. Atropine reinforces this action of adrenaline on the cerebral circulation.

II. Action of Acetylcholine. [*Ibid.*, 21–27.]

Acetylcholine dilates the cerebral blood vessels, and its effect is stronger and of greater duration in cerebral vessels than on the rest of the body. This fact presumably explains the occurrence of fatal cerebral hemorrhages in the course of treatments with acetylcholine preparations. H. H. SZMANT (Chem. Abstr.).

The "Shock Therapies" at the Ontario Hospital, London. Geoghegan, D. J. [*Canad. med. Ass. J.*, **56**, 15–24 (1947).]

Based on the observation of 469 patients treated by diverse shock therapies at the Ontario Hospital since 1944 the following conclusions are drawn: (1) Shock therapy is an indispensable part of a well-organized psychiatric hospital; (2) the duration of certain illnesses is notably shortened by the shocks; (3) several mental states of long duration are clinically ameliorated by this therapy; (4) the danger of this mode of treatment is minimal and it is possible to apply it to cardiorenal cases if the cases are well chosen; (5) electro-shock is the shock treatment of choice, insulin shock being reserved for patients resistant to electro-shock or for certain psychoses where this therapy is more particularly indicated as, for example, schizophrenia; (6) psychotic reactions due to certain infections or intoxications benefit from shocks; (7) curare should only be utilized in rare cases as an adjuvant of shock therapy; and (8) study should be continued as to the value of shock treatment as a prophylactic for certain mental states.

F. C. SUMNER (Psychol. Abstr.).

Effect of Convulsive Activity on the Concentration of Brain Glucose, Glycogen, Lactate and Phosphates. Klein, J. Raymond, and Olsen, Norman S. (Univ. of Illinois Coll. of Med. Chicago). [*J. Biol. Chem.*, **167**, 747–56 (1947); *cf. Stone, et al., C. A.*[3] **39**, 5309[8]; *Albaum et al., C. A.*, **40**, 6164[2]; *Kerr and Antaki, C. A.*, **32**, 996[6].]

Induced convulsive activity is accompanied by decreased concentration of brain glycogen, glucose, phosphocreatine, and adenosinetriphosphate, and increased concentration of lactate, adenosinediphosphate, and inorganic phosphate. The cerebral metabolism of glucose is markedly increased during convulsive activity.

LEONARD KAREL (Chem. Abstr.).

Effects of Some Old and Proposed Anticonvulsants on the Threshold for Electrical Convulsions. Chu, W. C., and Driver, R. L. [*Proc. Soc. exp. Biol., N.Y.*, **64**, 245–48 (1947).]

The possible therapeutic effectiveness of selected anticonvulsant drugs is tested initially by analysis of the effects of each upon the electrical threshold at which epileptiform convulsions are artificially induced in laboratory rats and rabbits. Four hundred tests were made on 210 animals, and 23 drugs were studied. One of the three hydantoins studied appeared "promising," although no more so than the form currently in use. Four drugs of the curare group and 5 vital dyes, including hematoxylin and vital red, were ineffective.

L. A. PENNINGTON (Psychol. Abstr.).

Isopropyl Alcohol, Other Ketogens, and Miscellaneous Agents on Thresholds for Electrical Convulsions and Diphenylhydantoin. Driver, L. [*Proc. Soc. exp. Biol., N.Y.*, **64**, 248–51 (1947).]

The difficulties inherent in administering ketogenic therapy in epileptic states led to the present testing of the effect of products of fat and carbohydrate metabolism upon thresholds at which electrically induced convulsions in laboratory

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animals appear. Results indicate that several chemical compounds exceed the effectiveness of dilantin as an anticonvulsant. The most promising were those chemicals related to acetone, of which group isopropyl alcohol exhibited a "tremendous anticonvulsant effect without ataxia or narcosis." It is hazarded that the effectiveness of the ketogenic diet rests upon the production of acetone in the body. Isopropanol in combination with dilantin raised the electrical threshold far in excess of the latter's anticonvulsant level.

L. A. PENNINGTON (Psychol. Abstr.).

Measurements of the Electrical Activity of Cholinergic, Adrenergic and Anticonvulsant Drugs. Barnes, T. C., and Mauer, I. (Hahnemann Med. Coll., Philadelphia, Pa.). [Arch. intern. pharmacodynamie, 73, 386–91 (1947).]

Prostigmine has a phase-boundary potential greater than any drug thus far studied. Phenobarbital and dilantin generate positive potentials, which counteract the negative acetylcholine potential. Benzedrine gives three times the value of paredrine. M. L. C, BERNHEIM (Chem. Abstr.).

Effect of Metrazole on the Electrical Excitability of the Respiratory Centre when Depressed by Phenobarbital. Arellano, Maria I. Robert de Ramirez de (Northwestern Univ. Med. School, Chicago). [J. Pharmacol., 90, 95–103 (1947).]

Intact cats, anesthetized with Na phenobarbital (I), and decerebrate cats, were given large intravenous doses of metrazole after the respiratory activity had been depressed with (I). These cats showed considerable recovery of respiratory activity. Decerebrate cats not given (I) showed no consistent stimulation of respiratory activity by metrazole. L. E. GILSON (Chem. Abstr.).

Effects of Some Old and Proposed Anticonvulsants on the Threshold for Electrically Induced Convulsions. Chu, Wei-Chang, and Driver, Robert L. (Stanford Univ. Med. School, San Francicso, California). [Proc. Soc. Exptl. Biol. Med., 64, 245–8 (1947).

Rats were protected more or less against electrically induced convulsions by isonipecaine, propazone (5,5-dipropyl-2,4-oxazolidinedione), diphenylhydantoin, methylhexylhydantoin, methylamylhydantoin, and di-isobutylhydantoin. The following were ineffective: 3-indolylmethylenehydantoin, curare, β-erythroidine, dihydro-β-erythroidine, quinine ethochloride, theophylline-NaOAc, hematoxylin, Congo red, neutral red, phenol red, methyl red, NH_4SCN, $MgSO_4$ and glutamic acid. A decrease of about 30 per cent. in the threshold was obtained by depriving rats of food or water or both for six days. L. E. GILSON (Chem. Abstr.).

Isopropyl Alcohol, Other Ketogens, and Miscellaneous Agents on Thresholds for Electrical Convulsions and Diphenylhydantoin. Driver, Robert L. (Stanford Univ. Med. School, San Francisco, Calif.). [Proc. Soc. Exptl. Biol. Med., 64, 248–51 (1947).]

Isopropyl alcohol, 1.25 gm./kgm. by stomach tube, had a marked protective action against electrically induced convulsions in rats, without producing ataxia or narcosis. It also increased the cortical depressant effectiveness of diphenylhydantoin. 4-Hydroxy-4-methylpentan-2-one (diacetone alcohol), 2,4-dihydroxy-4-methylpentane, Et acetoacetate, PrOH, iso-PrBr, and EtOH afforded some protection (all given by stomach tube). Acetophenone was highly protective but quite toxic. The following were ineffective (given gastrically); the common sugars; lactic, pyruvic, acetic, propionic, butyric, palmitic, citric, malic, succinic, malonic and fumaric acids: BuOH, iso-BuOH, iso-AmOH, iso-Pr ether, and EtOAc. Insulin and Na iodoacetate given hypodermically were ineffective.

L. E. GILSON (Chem. Abstr.).

Studies on Sleep. I. Increasing the Action of Barbiturates by Anticholinesterase Medication. Frommel, Ed., Bischler, A., Gold, P., Favre, M., and Vallette, F. (Univ. Geneve). [Helv. Physiol. Pharmacol. Acta, 5, 64–77 (1947) (in French).]

During barbital anesthesia in guinea-pigs there is a decrease in serum cholinesterase activity. The hypnotic action of barbiturates in guinea-pigs and rabbits is

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augmented by drugs that inhibit the action of cholinesterase, especially prostigmine and the Me_2-NCOOH esters of p-hydroxyphenyldimethylamine-HCl and p-hydroxyphenyltrimethylammonium iodide and methylsulfate.

II. Increasing the Action of Barbiturates by Drugs which Act on the Vagus, and the Action of Morphine and Scopolamine on Barbiturate Narcosis. [*Ibid.*, 78–84.

Acetylcholine salts, carbaminoylcholine pilocarpine-HCl and morphine-HCl sensitized guinea-pigs so that sleep was produced by doses of barbiturates ordinarily insufficient to produce an effect. Scopolamine-HBr had no such sensitizing action. One effect of morphine is to block cholinesterase. Pilocarpine acts as an excitant of the parasympathetic system; hence vagal activity appears to be concerned in sleep production.

III. Sympathomimetic, Sympatholytic and Parasympatholytic Drugs and Barbiturate Narcosis. Frommel, Ed., Favre, M., and Vallette, F. [*Ibid.*, 85–90.]

Ergotamine and the common sympathomimetic and parasympatholytic drugs do not increase the action of barbiturates. L. E. GILSON (Chem. Abstr.).

Barbiturate Poisoning and Treatment with Picrotoxin. Nunez, A. Ortega, and Ventura, A. Estades (Inst. J. C. Mutis, farmacognosia, Madrid). [*Farmacoterap. actual (Madrid)*, **4**, *No.* 31, 38–62 (1947).]

The action of barbiturates and the chemistry and pharmacology of picrotoxin are discussed. Dogs and cats were poisoned with lethal doses of phenobarbital orally or intravenously. Picrotoxin produces a temporary increase in respiration. The action is most rapid by suboccipital application. An intensive increase in depth and rate of respiration is complicated by convulsions. The effect of picrotoxin lasts for one to two hours, that of the barbiturate five to six days. Solutions in oil seem to have a longer action; in one dog, life seemed to be prolonged by picrotoxin in oil. In cases of circulatory failure the additional treatment with circulatory stimulants becomes necessary. A. E. MEYER (Chem. Abstr.).

Comparative Central Depressant Actions of Some 5-phenyl-5-alkylbarbituric Acids. Alles, Gordon A., Ellis, Charles H., Feigen, George A., and Redemann, Mildred A. (Univ. California Med. School, San Francisco). [*J. Pharmacol.*, **89**, 356–67 (1947).]

Additional evidence, from studies of the comparative central actions of dialkyl-, phenylalkyl-, and diphenylbarbituric acids, is presented to show that the mechanism which raises the convulsant threshold is different from the mechanism producing hypnosis as evidenced by ataxia and drowsiness. Anticonvulsant activity is intensified by the presence of one 5-phenyl group, diminished by presence of a second 5-phenyl group, and maximum with the phenylbutyl compound in the series of phenylalkyl (ethyl to hexyl) barbituric acids. Of the 10 compounds studied, 5-phenyl-5-butyl-barbituric acid showed the widest range between anticonvulsant and hypnotic activities. It showed marked anticonvulsant activity at dose levels below the hypnotic dose range. The hypnotic activities of the phenylalkylbarbituric acids are greatest with the compounds containing the smallest 5-alkyl groups, and this type of central depressant activity decreases with increase in the size of the alkyl group. L. E. GILSON (Chem. Abstr.).

Anticonvulsant Activity of Various Nitrogen Heterocycles. I. (Alkylthioether) Barbiturates. II. Phenyl (Alkylthiomethyl) Hydantoins. Cahen, Raymond L. (Maltbie Chem. Co., Newark, N.J.). [*J. Pharmacol.*, **88**, 343–52 (1946).

Most (alkylthioether) barbiturates are effective in the cat only in doses sufficient to produce ataxia. A few compounds of higher molecule weight exhibit the greater anticonvulsant activity independent of any depressant activity; however, the margin between effective dose and ataxic dose remains small. With the exception of the ethyl (tert-butylthioethyl) barbiturate, no compound has as great a duration of action as phenobarbital. Among phenyl (alkylthiomethyl) hydantoins studied in the cat, the Et derivative is the most active; however, it is only 25 per cent. as anticonvulsant as diphenylhydantoin and of shorter duration of action. The margin

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between effective and ataxic dose remains about the same for all these derivatives. (Alkylsufonylmethyl) hydantoins are much less active. (Alkylthiomethyl) hydantoins have a slowly developing anticonvulsant activity following oral administration in rat; they prevent metrazole convulsions over a period of 4·5 days repeated administration. C. J. WEST (Chem. Abstr.).

Experiments in Electrical Anesthesia and Barbiturate Basal Narcosis. Holmes, F. (Univ. Edinburgh). [*Brit. J. Anaesthesia*, **20**, 45–54 (1946).].

A comparative study was made of the effect of some common short-acting barbiturates on the strength of d.c. necessary to anesthetize minnows of varying sizes. Injection of pentothal-Na (Abbott) (I) was followed by an immediate and marked fall in current dose necessary to produce anesthesia; this effect lasted about one hour. Cyclonal-Na (May and Baker) (II) tended distinctly to raise the current-threshold above the pre-injection level, in some cases considerably so, during the period when the effect of the drug was wearing off. The duration of action was shorter and definitely more variable than that of (I). Evipan-Na (Bayer) (III) produced a distinctly irregular action and a sudden falling-off of the current-threshold at varying times after injection. In no case was there a return to the pre-injection level after an hour or more. (II) and (III) have the same chemical formula, yet tend to produce exactly opposite shapes of the curve towards the end of the experiment. No satisfactory explanation can be given at present for this phenomenon. Somnifen (Roche) showed a somewhat irregular action, lasting approximately one hour. Narconumal (Roche) (IV) appeared to have a constant and smooth action which also lasted about one hour. Narconumal in paraldehyde (Roche) caused the fish to become somewhat inco-ordinated some time after the injection and exhibited an action lasting approximately half the time of that produced by (IV). This is contrary to the generally accepted view that if two narcotic drugs are given simultaneously, not only summation but increase of their actions occurs. When used clinically in a few cases, this mixture either failed to produce anesthesia or did so for only a few minutes. Of the drugs tested (I) and (IV) were the most reliable and most constant. A second series of experiments with three fish of different sizes, also indicated that paraldehyde in some way counteracts (IV), shortening its duration of action to approximately half its normal time. RUTH BERGGREN (Chem. Abstr.).

Action of Curare on Temperature Changes in the Brain in Combination with Pentobarbital Narcosis. Feitelberg, Sergei, and Pick, Ernest P. (Mt. Sinai Hosp., New York, N.Y.). [*Proc. Soc. Exptl. Biol. Med.*, **64**, 345–8 (1947).]

In rabbits under light pentobarbital narcosis the intravenous injection of 2 mgm. of curare increased oxidation processes in the brain, causing a rise of 0·3° in brain temperature. Under deep pentobarbital narcosis it had the opposite effect. L. E. GILSON (Chem. Abstr.).

Effect of Narcosis on the Carbohydrate Metabolism of the Brain as Studied by the Analysis of Afferent Blood. Ivanenko, E. F., and Voïnar, A. O. [*Byull. Eksptl. Biol. Med.*, **14**, *No.* 10, 25–7 (1942).]

Results from experiments with 35 dogs in which the longitudinal sinus was exposed according to London show that anesthesia decreases the utilization of sugar by the brain, increases the utilization of lactic and pyruvic acids, and increases the output of glycogen. Hexanel or a combination of morphine, ether and chloroform was used for anesthesia. EUGENE ROBERTS (Chem. Abstr.).

Effect of Narcosis on the Glycogen Content of the Brain. Ivanenko, E. F., and Voïnar, A. O. [*Byull. Eksptl. Biol. Med.*, **14**, *No.* 11/12, 56–7 (1942).]

Experiments with 15 rabbits and 50 albino mice revealed that ether anesthesia significantly increased the glycogen content (I) of the brain. In fed rabbits, the increase was from 130·9 ± 8·2 to 223·6 ± 7·6 mgm. of (I) per 100 gm. of fresh tissue weight. In fasted mice, the (I) increased from 103·4 ± 6·2 to 128·8 ± 4·8 mgm., while in fed mice the increase was from 160·0 ± 5·7 to 201·3 ± 4·1. The anesthetic may act both by decreasing glycolysis and increasing the synthesis of (I) in the brain. EUGENE ROBERTS (Chem. Abstr.).

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Action of Narcotics on the Activity of Cholinesterase. III. Concentrations of Substrate and Enzyme in the Manifestations of Inhibitory Action of Narcotics on Enzyme Activity. Mikhel'son, M. Ya. [*J. Physiol.* (*U.S.S.R.*), **32**, 635 (1946).]

The reduction of cholinesterase activity by narcotics was storage at low initial concentrations of acetylcholine and with high values of cholinesterase concentration in the experimental solutions. The study was made in defibrinated dog blood, with EtOH as the narcotic. The above inhibition is strongest when the rate of acetylcholine hydrolysis is highest. G. M. KOSOLAPOFF (Chem. Abstr.).

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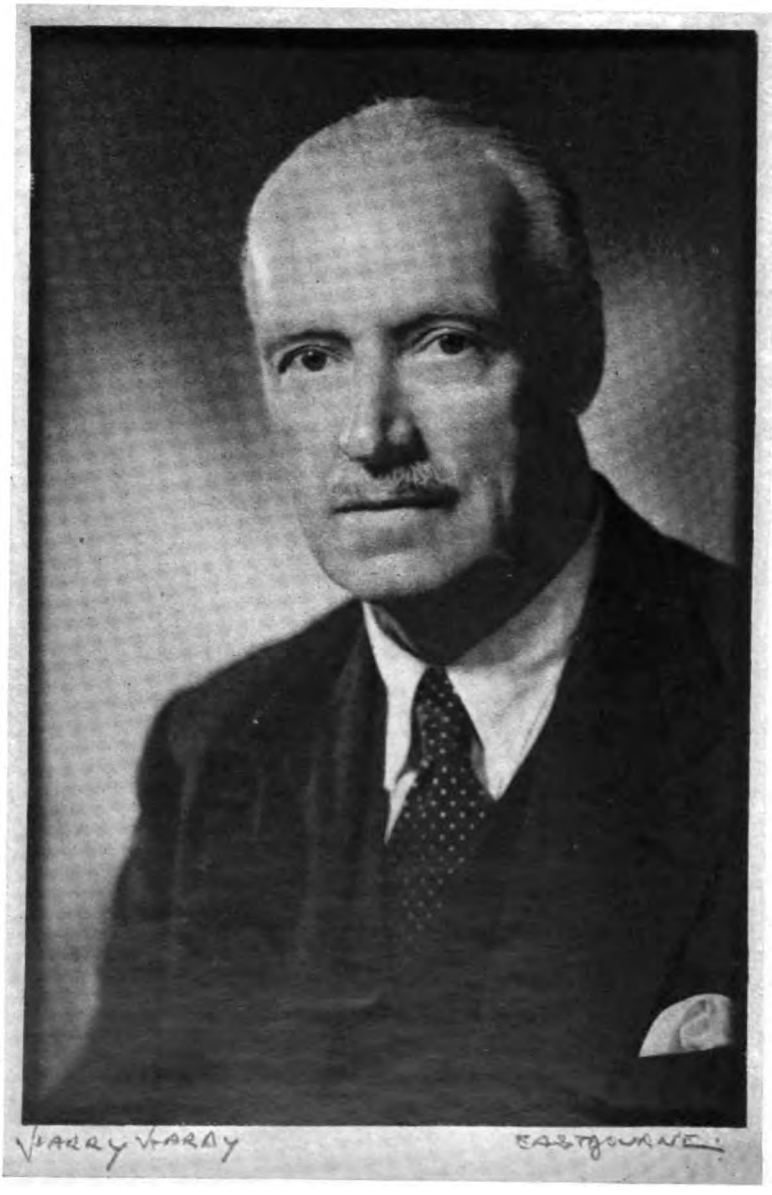

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President,
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THE
JOURNAL OF MENTAL SCIENCE

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Part I.—Original Articles.

PSYCHIATRIC RUMINATIONS.

THE PRESIDENTIAL ADDRESS DELIVERED AT THE ONE HUNDRED AND SIXTH ANNUAL MEETING OF THE ROYAL MEDICO-PSYCHOLOGICAL ASSOCIATION HELD AT EASTBOURNE, 10 JULY, 1947.

By W. G. MASEFIELD, M.R.C.S., L.R.C.P., D.P.M.

By time-honoured tradition one of the first duties of your newly-elected President is to inflict upon you a Presidential address. This is at once a very considerable responsibility and a privileged opportunity, but the feelings of awe and apprehension with which I face such a distinguished and erudite audience are mercifully lessened by the knowledge of the unwritten rule of our Association that no outspoken criticism of the subject matter of the address is permitted. I wish to ask you to bear with me, for a few minutes, whilst I put before you what I think may best be termed psychiatric reflections or ruminations, based on a certain amount of experience and, I can say quite sincerely, a true interest in the matters touched upon. I fear, however, that I have little or nothing original to offer you.

It appears to me that the present is a suitable time for something in the nature of a stocktaking of our position both as members of our Association and as psychiatrists—especially as we are shortly to embark upon the great adventure of a comprehensive Mental Health Service within the National Health Service. In our Royal Charter, granted in the 85th year of our Association's existence, and now, it is worthy of note, twenty-one years of age, the objects and purposes for which our Association is constituted are stated to be "for the formation and cultivation of science in relation to Mental Disease and the improvement on the treatment of persons suffering from Mental Disorder and to facilitate the exchange of information and ideas on the subjects amongst the members of the Association and otherwise." The succeeding subsections detail the methods by which the objects and purposes may be furthered: I quote—"by holding Meetings of the Association and Con-

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ferences with other Associations in the United Kingdom or elsewhere; by publishing a periodical journal; by printing, translating and distributing books or treatises on or connected with science in relation to mental disease or with the treatment of those suffering from mental disorder or with allied sciences; by expenditure on sending and maintaining in the United Kingdom or elsewhere any person or persons chosen by the Association for the investigation of science in relation to mental disease, treatment of mental disorder or allied subjects, and on inviting any person or persons, desired by the Association, to meetings convened by the Association, and on sending and defraying the expenses of representatives of the Association to any meetings convened for similar objects in any part of the United Kingdom or elsewhere; by promoting and encouraging the study of science in relation to mental disease, of the scientific treatment of mental disorder and allied subjects by providing, instituting and maintaining lectures, classes, examinations and other means of instruction." These are the main points concerning the aims and objects of our Association to which I wish to draw your particular attention. I make no apology for quoting them and for reminding you of this very comprehensive (although perhaps a little old-fashioned) wording, and especially of the international implications, which you can read for yourselves in the Charter and Bye-Laws, and to which each ordinary member after election subscribes his or her name, thereby promising that he or she will promote the objects of the Association to the best of his or her ability.

During the past 40 years the membership of the Association has much increased in numbers—there are now on the books well over 1,000 names of active ordinary members, representative, I am very pleased to say, of all the branches of psychological medicine. We are all glad to welcome to our membership the recently elected Associate Members who have qualified for such addition to our ranks as being "non-medical members of the learned Professions specially interested in Psychological Medicine and its allied subjects." We take pride also in our Corresponding Members from overseas. The Association has certainly travelled a long way since the days when it was virtually a "closed shop" for those working in mental hospitals of local authorities and in licensed houses—and mainly Superintendents at that! I believe that the prestige and authority of the Association has increased considerably in recent years, that the quality of the papers and discussions at our meetings is of a higher level than ever before, and that the influence of the *Journal of Mental Science* is being steadily raised. That is all on the credit side, but nevertheless this is no time for complacency or for sitting back with halos of self-congratulation over our heads! The recent division of the activities of the Association into administrative committees and scientific sections is, I am sure, a step in the right direction, but we must constantly bear in mind our avowed aims and objects, and endeavour to make certain that we are keeping in step with progressive psychiatry. If we are to claim the right, as we most assuredly should, to speak with an authoritative voice for psychiatry in this country we must, I feel convinced, each of us cultivate a wider outlook concerning our great specialty. As I see it, the one great failing to which any psychiatrist is prone to succumb is narrowness of vision. It is imperative that we should

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each be tolerant of our colleagues' work and aims. Quite clearly we cannot be equally expert in each branch of psychological medicine, but we should be able to appreciate all forms of honest psychiatric endeavour. We hear and read far too much of what can only be fairly described as prejudice in connection with some of the methods of treatment now in use—and prejudice is surely no more than emotionally-toned ignorance or (perhaps less crudely and more politely) insufficient knowledge. I should like to make it quite clear that this criticism applies equally to those whose choice of treatment is predominantly by physical methods as to those whose allegiance is mainly to psychotherapy. In our present stage of knowledge it is surely unwise and unpractical to condemn any form of treatment, carried out with all due care and thought for the patient, which has been shown to achieve beneficial results, merely on the grounds that the way in which such results are brought about is only partly understood. It seems to me of the utmost importance that the psychological and physical ways of approach in the treatment of the varying degrees of behaviour disorder should be available, and that it should be recognized that in a high proportion of cases the two methods are complementary—the one being incomplete without the other. I do most sincerely urge that more use should be made of psychotherapeutic methods, of an elastic kind, in the treatment of the cases in our large mental hospitals. For a psychiatrist to have only one type of treatment to offer is surely specialism of a very inferior variety. One of the aims of the Association should be to encourage and to assist our younger members to visit special treatment centres both at home and abroad, and it is to be hoped that in the near future such valuable additional experience may be obtained far more easily than in the past. We have been too insular in our psychiatric outlook, and we ought to ensure that our rising generation of specialists has a reasonable opportunity of becoming familiar with international psychiatric thought and developments. One plea, however, I do put forward, and that is that their case-reports, papers and indeed their spoken contributions should be in plain English. At the present time some of our younger intellectuals make a point of using hybrid polysyllables of ill-mated classical parentage, the results being unpleasing both in form and sound, and certainly not generally understood. It has been well said that "unless one is a genius it is best to aim at being intelligible." It is my opinion that a good deal of the cynicism and prejudice on the part of our medical and surgical colleagues, and also of our legal friends, with regard to matters psychiatric, is brought about by the jargon which finds its way into a certain number of reports signed by psychiatrists. It should be quite possible to describe any case of mental illness using only words to be found in a good English dictionary. I stand firmly for simple language, and I believe that psychiatry will obtain a more sympathetic hearing with the majority of the medical and other learned professions when we speak more plainly. That brings me to the question of our relationship with our professional colleagues, which, I fear, at times tends to be somewhat equivocal and unsatisfactory. It is unfortunately true to say that we are thought by some to make unwarranted claims for psychiatry. It is made plain to us that we should realize that we are only in the process of development, and that we should be content, for the present at any rate, with

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a place in the medical world as a minor specialty. I think I cannot do better, in this connection, than quote from the "Memorandum on the Future Organization of the Psychiatric Services," the joint production, issued in 1945, in the preparation of which our Association took a prominent part. I quote, "Where Psychiatry begins and ends has not been settled," and again, "Psychiatry is not a limited specialty. It permeates and influences General Medicine, Surgery, and Obstetrics and Gynaecology." The main difficulty is that in the eyes of some of the older and more conservative of our medical colleagues psychiatry represents simply the treatment of frank cases of mental disorder and of course mainly in mental hospitals or "asylums," which, I regret to say, is still the term used far too often by members of our own profession. It is, therefore, all important that, if possible, we should be able to agree upon a definition which covers the comprehensive modern conception of psychiatry, and at the same time shows its influence on all other branches of medicine, One suggestion, which is surely an over-simplification, has been that psychiatry can be described as "The Personal Aspect of Medicine"—I look upon this as being too vague for our purpose, remembering that it has been said that "A definition is nothing but an abbreviation in which the user of the term defined may please himself!" I venture to put forward as a possibly acceptable solution that "Psychiatry is that branch of medicine which is concerned with the prevention, causation and treatment of deviations of human behaviour." This emphasizes the importance of studying the personality behind the illness, and suggests the contribution which the psychiatric approach may make in cases of somatic illness. On the whole, however, I think that many of us will agree with Edmund Burke, who said, "I have no great opinion of a definition, the celebrated remedy for the disorder of uncertainty and confusion."

"Why is the patient ill?" is, to my mind, a question for which an answer should be sought just as zealously as any other form of investigation. There is a great deal of truth in the old saying that "More patients are ill because they are unhappy than unhappy because they are ill," and it is high time that we gave up dividing illness strictly into the two classes of organic and functional. There is much scope for missionary work in this connection, and I feel that we may have been remiss in the past in not preaching and teaching the importance of the emotional aspect in bodily illness; nevertheless I am persuaded that the younger generation of physicians and surgeons is becoming progressively impressed with the need for a detailed knowledge of the patient's background—home life, employment conditions and social environment—whatever the nature of the symptoms presented may be. This awakening of psychological interest is largely due, I believe, to experience gained in the fighting services and civilian practice will certainly reap the benefit. It is thus becoming established that, however thorough the physical examination of a patient may be, a psychiatric approach is needed as well, and that this may, in a number of cases, provide a clue as to the reasons for the continuance of the patient's invalidism. But we, as professing psychiatrists, must be keenly on our guard lest we become obsessed with the psychogenic view-point and so omit a thorough and careful physical examination of our patients. The anxious subject derives

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great confidence from a properly conducted investigation of his bodily symptoms, and without such investigation no course of psychological explanation and reassurance carries much weight or authority. The psychiatrist who disregards the somatic side of the picture is surely not far removed from the ranks of lay psychotherapy. But there is, nevertheless, no doubt that a wise and careful technique is required in the carrying out of the physical examination of the fearful and anxious neurotic. Nothing is more distressingly easy than to suggest additional or exaggerated suspicions or fears of organic disease by a manner which betrays a lack of confidence in one's own findings or by a vague reference to the desirability of further investigation. I feel strongly that the members of the Association have a duty to perform to the general public by spreading the gospel of the modern conception of psychiatry. I am a believer in the dissemination of knowledge—yes, of medical knowledge—which is based on scientific and proven facts. In this field it should be our aim to further the preventive side of psychiatry by instituting lectures and by providing suitable literature for the public. There is accumulating evidence that such enlightenment would be welcomed. Teachers, clergy, parents and adolescents are all groups for whom organized efforts on our part are overdue. For some time past there has been a ready sale for weekly and monthly periodicals exhibited on the bookstalls, which offer short-cut cures for the inferiority complex, blushing, shyness, frigidity and even yet more intimate handicaps at remarkably low cost. My view is that we as psychiatrists should not be content to leave this position as it is. The knowledge of the main fundamental facts concerning the autonomic nervous system and the endocrine glands linked with elementary medical psychology and explained with psychiatric insight would, in my opinion, prove a real buttress to many otherwise vulnerable and susceptible personalities. The opportunity of providing teachers with suitable material for handing on to their adolescent pupils is of particular interest at the present time. With the addition of a year's school life at the most impressionable age (14 to 15 years) for the vast majority of the children, the possibilities of education for character are immense—character being defined as human nature in its highest form.

In these days when broken homes and unfortunate or indifferent parental influence are so common, the duties, obligations and discipline of adult life, if inculcated at all, must in many cases be learnt in school or in social clubs, and the responsibility of the teacher or social leader is very great. I wonder if it is stretching a point too far if we see here the possible clue to the increasing number of adolescent and young adult anti-social personalities which have caused so much concern in the Services. I look upon these young men and women as being sentimentally immature and without any true character formation. They have no sense of altruism, and live on the fringe of society as "lone wolves" prompted by their primitive instincts, but without any allegiance to herd or social tradition. The conscience or moral sense has never developed because there has been no home or other satisfactory guiding influence to produce the necessary training and discipline; indeed one has seen the exact opposite in operation, viz., what may be termed an "immoral sense," highly developed as a direct result of home and parental influence of an unfor-

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tunate kind, leading to thieving, lying and sexual laxity. There must surely be hope for reformation of such individuals in a completely changed environment with sympathetic training if sufficient time is allowed for a radical readjustment to social life.

I must confess that I see no justification for the view that there is, in such cases, an inborn defect which prevents the development of the moral sense, and surely it is only in the cases of organic cerebral lesion that the term moral defective can rightly have any application. I realize that a valid criticism of this view regarding the undesirable influences which tend to produce the psychopath is that cases showing strong anti-social tendencies and absence of altruistic feelings may crop up in families where religious and moral principles have always been prominent. The answer, I think, is that these are examples of the effect of frustration and rebellion against authority which has produced strong contra-suggestion, resulting in opposing moral and social beliefs and behaviour. In high social and political circles there have been notable examples of this particular type of black sheep of either sex. Another group of cases from which arise many juvenile and older delinquents is that of the highest grade mental defectives who tend to be so readily suggestible and easily influenced by those whose ethical standards are low. Among Army cases referred for a psychiatric opinion I have found that the high grade defective is frequently tried beyond his powers in the course of modern training, and that this results either in minor delinquency or in vague neurotic symptoms. It is at any rate satisfactory that there is a growing recognition that the psychiatrist may be of assistance in such situations. If we are to make progress in the preventive side of psychological medicine, close co-operation must be maintained with social medicine and our colleagues in public health. We are living in an age of social changes ; class and educational differences are being lost, and fresh problems of community life are arising almost daily. Overcrowding and the housing shortage are evident in both town and country, and the temporary prefabricated houses, with hardly a semblance of privacy, are far removed from anyone's idea of " An Englishman's Castle "! The housewife's worries are hardly less than during the war years—queues, rationing and shortages make her day-to-day tasks extremely difficult. Such conditions are the forerunners of feelings of frustration and dissatisfaction, which lead towards neurotic forms of illness. Service pensioners, with some form of psycho-neurotic disability, are finding the housing problem particularly trying and difficult of adjustment, and are thereby handicapped in their progress towards rehabilitation. Loneliness is found in the midst of overcrowing, and this applies to those of all ages. We must all take a share in shouldering social responsibilities. I believe that well organized community centres and social clubs have a great part to play in the prevention of early symptoms of mental disharmony and neuroses. Recreation and relaxation in cheerful and congenial surroundings conduce to positive health, and one of our main aims must be to produce a real desire for fitness and good health and a pride in its possession which will overcome that weakness which grasps at escape into illness. As psychiatrists, who claim to be concerned with behaviour disorders of all types, we have on the whole paid too little attention to the subject of child psychiatry. The

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study of maladjustment and emotional instability in childhood should take a leading part in the long-term policy of preventive mental treatment. It must be confessed, however, that there are not at the moment a sufficient number of psychiatrists experienced in this branch to take charge of all the clinics which are required so urgently in many parts of the country. The ideal plan is not for narrow specialism in this field, but for an increasing number of psychiatrists experienced in other directions to take their share of work in the clinics for children and so gain the additional experience gradually. It may well be that in the National Health Service a considerable part of the work of child psychiatry may be undertaken by those who are expert in mental deficiency. Their specialized knowledge has been kept within the confines of institutions and colonies far too long. Under the forthcoming regional planning it is to be hoped that every experienced psychiatrist in the Service will take his or her share of extra-mural duties. Psychiatry has much to gain from regional organization; of that I am convinced. It is quite impossible for medical services to function efficiently in watertight compartments as has been attempted unfortunately in past years. Co-ordination and co-operation to be successful require energy and good will on the part of all concerned. The future of psychiatry, as outlined in our joint memorandum, is in the hands of our younger members and of those who will be taught and guided by them; I look to them with confidence to see that our mental hospitals maintain a steady rate of progress and modernization. For obvious reasons during the war years some retardation was inevitable. Active and vigorous individual treatment for all types of case must be the rule. The idea that a mental hospital is in any way a home for incurables should once and for all be relegated to the past. The best possible type of young practitioner must be attracted to the work. This will be brought about only if the highest clinical standards are maintained. A term of apprenticeship in general practice is, in my opinion, highly desirable before taking up the specialty; in no other way can social conditions be so well studied and the early signs and symptoms of mental illness be so well observed. Indeed much minor psychotherapy is carried out and must continue to be carried out by those practising general medicine; it is well that it should be so, but it emphasizes the importance of the medical student receiving at the hands of his (or her) specialist teachers the broad outlines of modern psychiatry. Specialists in psychiatry are, as yet, too few in number to fill adequately all the posts which will be required in the new service. In the mental hospitals alone a very considerable increase in the numbers of the medical staff—part-time and whole-time—is necessary if the standard of treatment of *all* the patients is to be raised, as it should be, to that obtainable in the best general hospitals. We now have the varied means of treatment at our disposal—psycho-therapeutic, physical, surgical, pharmaceutical, occupational and recreational—and I want to see every ward in a mental hospital an active treatment ward. I hope that it may not be long before those whose only failing is due to the effects of old age are treated and housed in a more suitable place than a mental hospital ward. In the past, for a number of reasons, we have been far too ready to label a case "chronic"; and an aggregation of such cases, which are to a great extent the creation of

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their surroundings, has made up a "chronic ward." That is the situation which we must determine to abolish. Given an adequate staff, medical and nursing, of sufficient experience, I see no reason why every individual patient should not be on the *active* treatment list. An Utopian prospect perhaps, but none the worse for that. The nursing question is a very serious one. I feel sure, however, that the more bedside nursing we have to offer, the more student nurses we shall attract. The large wards overcrowded with patients receiving little more than custodial care have acted as a very decided deterrent to the enthusiasm of a young, budding nurse; the facts must be faced, and we can no longer afford for the service to be unpopular. But I have the greatest faith in the present generation of younger (or at any rate less old) psychiatrists. I believe that, speaking generally, their interest in the work is greater than that of the preceding generation largely because of the advances in knowledge and possibilities in treatment and that, as the country's circumstances permit, new mental hospitals will be planned and built with smaller wards suited for continuous and intensive treatment and for a total patient population of not more than a thousand.

The simplification and modernization of the law relating to mental treatment—and especially as to the admission of patients into hospital—is now generally recognized as being over-due, but must still await its turn in the legislative queue. I look forward, however, eagerly to the time when very considerable extension of the use of temporary treatment without judicial intervention is permitted by amendment of the Act.

The responsibilities of our Association and of its individual members will be very considerable as the skeleton plan of the comprehensive Mental Health Service is organized, system by system, until it comes into being as a vivid entity. I believe that the prospects are bright, and that the opportunity of working in close harmony with general medicine is before us.

The pessimists in this country have always been wrong. I am an optimist. As regards psychiatry, "the present interests me more than the past and the future more than the present."

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THE IDENTITY OF ALZHEIMER'S DISEASE AND SENILE DEMENTIA AND THEIR RELATIONSHIP TO SENILITY.

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INTRODUCTION.

Since Alzheimer (1907) described the disease which bears his name there has been considerable controversy about its relationship to senile dementia and senility. In the course of years there has been little advance towards a solution of the problem.

A review of the literature on Alzheimer's disease and senile dementia seemed to show that there were no clinical, pathological or aetiological grounds for distinguishing between them. There was plainly a similarity to normal senility, in that the same histological features occurred in the brain in this condition, provided that the individual lived long enough.

It was decided, therefore, to examine the brains from consecutive autopsies at a mental hospital in order to discover how frequently the changes characteristic of Alzheimer's disease and senile dementia occurred. One hundred and fifty brains were examined. These histological features were frequently found, and were seen to vary in quantity, quality and distribution. Often they could not be related to the clinical findings, and unless they were profuse, they did not seem to give rise to any symptoms. The parenchymal changes in the brain were found in different stages of development as it were, depending upon whether the patient succumbed to intercurrent disease. Moreover, cases of Alzheimer's disease and senile dementia overlapped, and in some cases it was not possible to differentiate between the two.

It is recognized that these dementias are closely related to the process of ageing, and these findings seemed to suggest that the central nervous system was ageing in advance of other parts of the body in Alzheimer's disease and senile dementia. Only in normal senility had the other systems of the body aged at the same rate as the central nervous system.

It was with these ideas in mind that this paper was written. A review of the literature from a clinical, pathological and aetiological standpoint is presented first. This is followed by a section indicating the relationship of Alzheimer's disease and senile dementia to normal senility. In this section some suggestions are put forward which seem to follow from the review of the literature. The section also forms an introduction to the case material which follows, and to the discussion.

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Clinical.

Grunthal (1926) has described three stages in the clinical course of Alzheimer's disease:

(1) A gradual memory loss, disturbance of perception, carelessness in work and appearance, disorientation for place, weakness or epileptiform attacks, some loss of words and slurred speech.

(2) Complete disorientation for time, place and person, dulling of comprehension, inability to read or do sums.

(3) Extreme irritability with paraphasia, uncleanliness and stereotyped movements.

Unfortunately, however, many cases in the literature do not conform to these stages, and Rothschild (1934), and Rothschild and Kasanin (1936), remark that individual clinical pictures differ considerably.

The latter authors report cases (Cases 2, 3 and 4) of Alzheimer's disease with some somatic features that are associated with senile conditions. They remark that such cases "suggest a close relationship to senility." They go on to say that in such cases "the chief difference between Alzheimer's disease and senile dementia is quantitative, the changes being severer in the former disease than in the latter." In speaking of Alzheimer's disease, they say "the regression is in some respects more profound than that usually noted in senile dementia. The more vigorous reaction to the disease may be based on the fact that younger persons are involved." These statements do not support their conclusion that Alzheimer's disease "may be regarded as a fairly well defined clinical entity," and only suggest that "the disease" is the same in both Alzheimer's disease and senile dementia.

A frequent finding in Alzheimer's disease and senile dementia is overactivity. It is specifically mentioned by Fuller (1912) in his review of the published cases of Alzheimer's disease, and McMenemey (1940) and Stengel (1943) and many others remark upon it. Hannah (1936) says that Alzheimer's disease is characterized by "energy misdirected," especially in the early stages, and senile dementia by exhaustion of the whole organism from the start. He believed that the two conditions could be distinguished clinically, but admitted that there was "overlapping," and that there were many similarities. It is difficult to know what is meant by "energy misdirected," and, as has been mentioned already, cases of senile dementia often show a marked motor unrest, and are far from exhausted at the beginning of the illness.

In contrast to this, Hemphill and Stengel (1941) have published a case of Alzheimer's disease, in which no motor unrest was noted apparently, and the clinical picture was one of depression. English (1942) also considers that depression is an outstanding feature of Alzheimer's disease, but in discussing the differential diagnosis between this psychosis and senile dementia, he says that the former are "usually more overactive." He fails to note any consistent finding to distinguish the two.

McMenemey (1941) suggests that there are "at least," two clinical varieties of Alzheimer's disease, and believes that atypical clinical cases are common. He remarks that although many authors consider there are differences between

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Alzheimer's disease and senile dementia, we must be prepared to find borderline cases between the two, and quotes Grunthal (1930) as saying that the only difference may be a tendency in Alzheimer's disease to more focal symptoms.

The close relationship between these two conditions is emphasized by Jervis and Soltz (1936), who say that it is widely accepted that Alzheimer's disease is an early atypical form of senile dementia. Also by Marchand (1940), who regards Alzheimer's disease, Pick's disease and " la démence pure sans athérome " as being variants of the same condition, and remarks that the differential diagnosis between these three during life is frequently impossible. Also by Boyd (1936), who suggests that it is not possible to differentiate Alzheimer's disease from other diffuse diseases of the cortex solely on the psychological picture. Here, too, Rothschild's (1934) comment on his own cases may be aptly quoted: the symptom-complex of Case 3 resembled Pick's disease, and that of Case 5 more nearly approached senile dementia.

Bay and Weinberg (1942) refer again to Grunthal's three stages, and say that they are seldom seen in a pure form. They point out that if an attempt is made to define Alzheimer's disease as a clinical entity by perusing the literature, a variety of impressions will be gained, depending upon which authors are consulted.

In fact, there are wide clinical variations in both these conditions, and it is suggested here that this is due to differences in (*a*) the personalities of individual patients, (*b*) the site and severity of the pathological lesions, (*c*) factors in the environment. Critchley (1942) has described the following clinical subtypes of senile dementia: a confusional, a maniacal, a melancholic and a paranoid type. The same might be done for Alzheimer's disease.

It seems that these two conditions are not to be distinguished from one another clinically except by the arbitrary limits of age. But even about this there is some controversy.

At first it was thought that Alzheimer's disease occurred in the presenium only. Then Barrett (1913) described a case aged 33 years, and considered that the presenium could not be extended to include this case, so he says, " Alzheimer's disease is not confined to presenile years." Other cases were reported in the fourth decade, and finally Malamud and Lowenberg (1929) described a case in adolescence.

In the meantime, senile dementia had been strictly confined in the senium. However, this period proved to have rather vague boundaries. The earliest figure is that of Hannah (1936), who proposed the age of 55 as being the upper limit of the presenium. But 65, or even 70, were suggested by other workers. Finally, McMenemey (1940) considered that the age limit in each case of Alzheimer's disease " must be judged on its own merits in view of the known differences in ageing in families and individuals." It appears impossible, therefore, to distinguish between these two conditions clinically.

Pathology.

The characteristic pathological changes of Alzheimer's disease are the widespread atrophy of the cortical neurones of the brain, with the presence of neurofibrillary alterations, " spirals," " loops," or " tangles," and miliary plaques.

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The neurofibrillary tangles are the remnants of ganglion cells (Alzheimer, 1911 ; Critchley, 1929 ; Hassin, 1933).

The origin of the plaques is still the subject of controversy, and will be referred to later. Localized areas of cortical atrophy may occur, but no particular part of the brain seems to be affected primarily. Generally speaking the blood vessels show minimal changes, and usually are not regarded as playing an important part in this condition. The work of Pickworth (1938), however, on the capillary bed in the brain suggests that alterations in the blood supply to different parts of the brain may prove a major factor in determining clinical features, and may be of aetiological influence also. This question is dealt with, however, at greater length under the section on aetiology.

The above lesions are not necessarily constant. Thus Alzheimer (1911), Fuller and Klopp (1912), Lowenberg and Rothschild (1931) and others have described cases in which no neurofibrillary alterations occurred, and Rothschild (1934) has remarked, "A particular type of lesion may be completely lacking in Alzheimer's disease without invalidating the diagnosis."

In spite of this statement, however, it is doubtful whether this psychosis can occur without the presence of plaques. It seems that only one case has been recorded in which the neurofibrillary changes occurred alone. Rothschild and Kasanin (1936), who published the case, regard it as an instance of toxic psychosis, and not Alzheimer's disease, a diagnosis which will be commented upon later.

The plaques, then, are regarded here as being an essential feature of Alzheimer's disease.

Unfortunately, in many cases, the diagnosis of Alzheimer's disease has not been based upon the pathological lesions only, and several workers have sought confirmatory evidence in the clinical features of this psychosis before making a diagnosis. Where they believe they have found atypical clinical features they reject the diagnosis of Alzheimer's disease, usually without providing a substitute. Thus Jervis and Soltz (1936), when reviewing the so-called "juvenile" cases of Alzheimer's disease reported by Perusini (1910), Urechia and Danetz (1924), Lowenberg and Waggoner (1934), Barrett (1913), Malamud and Lowenberg (1929), and Schottky (1932), all of which show typical pathological changes, disagree with this diagnosis in all except three cases, on the grounds that the pathological lesions are "insufficient," or that they show atypical clinical features. Also Rothschild and Kasanin (1936) describe a case with all the pathological lesions of Alzheimer's disease, which they regard as a case of toxic psychosis, because of its clinical features. This case also will be commented upon later. It is sufficient to remark here that the review of the signs and symptoms of Alzheimer's disease above, shows how difficult it is to say what is typical and what is atypical clinically.

In senile dementia the pathological lesions may be precisely the same as in Alzheimer's disease, but again not necessarily so. Thus neurofibrillary changes were found only in 85 per cent. of cases by Grunthal (1930), and in 92 per cent. by Rizzo (1924). And Rothschild (1937) and Lowenberg (1937) consider that senile dementia can occur in the absence of plaques, but Uyematsu (1923) and Grunthal (1936) do not agree with this. Again, it is con-

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sidered here that if senile dementia is to be established as an entity at all, it must have some definite pathology, and the miliary plaque has proved to be the most constant parenchymal lesion. It should be emphasized, therefore, that in both these conditions the miliary plaques are the basic histological finding.

With advancing years vascular degeneration and sclerosis become increasingly evident. It cannot be doubted that such factors will prove of major importance in senile dementia, and will presumably modify the clinical features. It has been suggested already that similar conditions may occur in Alzheimer's disease, and it may be that these vascular changes are responsible for the "atypical" clinical features which have caused so much confusion in the past. There is no evidence that miliary plaques themselves produce dementia. Kinnier Wilson (1940), in speaking of the miliary plaques, says, "Any attempt to link their occurrence with this or that clinical symptom is futile." The mental deterioration is caused by the destruction of the nerve cells, which may be a primary event due to inherited qualities in the cells, or may be secondary to vascular changes or other factors unknown at present.

Miliary plaques have been found in conditions other than senile dementia and Alzheimer's disease. Gellerstedt (1933) found plaques in 84 per cent. of a series of normal elderly persons, and Marinesco (1911) and Critchley (1931) have described them also in such people. Gillespie (1933) and McMenemey (1941) have pointed out that both plaques and neurofibrillary changes have been observed in many different diseases, mostly neurological. But McMenemey remarks that they are "not abundant" in conditions other than Alzheimer's disease and senile dementia. Probably in these cases the patient has died before the parenchymal lesions have had time to become profuse.

Attempts have been made to distinguish between Alzheimer's disease and senile dementia by a quantitative examination of the parenchymal lesions. Critchley (1930) regards the neurofibrillary changes as being more frequent in Alzheimer's disease and the plaques more frequent in senile dementia—a conclusion hardly consistent with the cases of Alzheimer's disease mentioned above in which no neurofibrillary change was noted. Simchovicz (1910, 1924) described an index of miliary plaques based upon a frontal and occipital count. He believed that in senile dementia this index was greater than one, and in Alzheimer's disease less than one. His methods have been criticized aptly by McMenemey (1941), who points out that there must be many uncontrollable factors influencing the count in each case. Nevertheless, Mayer-Gross (1938) thought that the lesions in Alzheimer's disease were more frequent in the posterior parts of the brain, and in senile dementia in the frontal half. This conclusion has not been supported by other workers, notably Jervis (1937) and McMenemey (1941).

Finally, the miliary plaques have been scrutinized in the hope of differentiating between these two conditions. Hannah (1936) found that the plaques in Alzheimer's disease were larger than in senile dementia, and that they did not have any microglial reaction around them. Similar investigations were carried out by Jervis (1937), who concluded that the qualitative pathological findings were the same essentially in Alzheimer's disease and senile dementia. The

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position has been clarified by McMenemey (1941), where he quotes the opinion of Hortega that the activities of the microglia are the same in both Alzheimer's disease and senile dementia, the only difference being one of degree. Jervis and Soltz (1936) examined this problem also, and say, " We feel, as does Grunthal, that from the pathological viewpoint alone Alzheimer's disease cannot be differentiated from senile dementia."

Aetiology.

1. *Heredity.*

Familial examples of Alzheimer's disease described by Schottky (1932), Von Braunmühl (1932), Lowenberg and Waggoner (1934), and McMenemey, Worster-Drought, Flynd and Williams (1939) suggest that an hereditary factor may be present.

In addition to these, James (1933) has mentioned a case of Alzheimer's disease with the same condition occurring in one or more siblings, the father probably suffering from Pick's disease. Lowenberg (1937) refers to an example of senile dementia in a father, followed by Alzheimer's disease in his son, and Lowenberg and Waggoner (1934) say that heredity may be of aetiological importance. English (1942) has described a case in which the mother and maternal siblings probably suffered from Alzheimer's disease. Henderson (1933) also considers that hereditary factors are present in Alzheimer's disease. Nevertheless, no further evidence for an hereditary factor has been forthcoming, and more recent writers, notably Ferraro and Jervis (1941), Hemphill and Stengel (1941), and Stengel (1943), expressly mention that no hereditary factor could be traced in their material. Also English (1942), in spite of his case quoted above, considers that heredity is not a major factor in this disease. These familial examples, moreover, are rare when compared with the large number of cases of Alzheimer's disease that have been reported. This does not exclude the possibility of genetic transmission, however, and in this connection it is interesting to note that the cases of Lowenberg and Waggoner (1934) and McMenemey *et al.* (1940) followed upon a marriage of first cousins.

As regards senile dementia, Grunthal (1936) considers there is no evidence for an hereditary factor—a statement with which Rothchild (1937) agrees. The case of Lowenberg's (1937) quoted above indicates once again the close relationship between Alzheimer's disease and senile dementia, and as there is evidence that heredity may be a factor in the former condition, it may be that it is a factor in the latter also.

The question of hereditary transmission is referred to again in the discussion on the case material.

2. *Somatic Factors.*

There has been no evidence that vascular changes are responsible for the parenchymal lesions in Alzheimer's disease or in senile dementia. In the former condition the cortical vessels show sclerotic changes frequently, but these do not seem to be more marked than in the brains of normal people of the same age. In senile dementia the arteries are even more affected, and

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it is probable that restriction of blood supply is responsible for the death of many nerve cells. But how much this destruction is caused by arteriosclerosis and how much by other factors it is impossible to say. It may be noted that the miliary plaques do not occur usually in relation to the capillaries, and there is no evidence that vascular changes play a part in their formation.

Pickworth (1938) identifies mental and emotional states with a cortical capillary mosaic pattern, which is itself the controller of the synaptic junctions of the neurones of the central nervous system.

The blood flow in the various capillary patterns is controlled by impulses from the higher reflex arcs of the central nervous system and by sympathetic stimuli, and sustained in these channels by metabolites and hormones. The capillary mosaic is susceptible also to alteration by toxins, but once fixed, a particular pattern tends to persist. Pickworth says: "Mental disorder can therefore be identified with a mixing up of normal and abnormal capillary mosaic patterns. Fragments of some pattern may be assumed to persist coincidentally with fragments of other capillary patterns, in which case a stimulus reaching the brain results in a behaviour corresponding with the predominant type of pattern, coloured by other fragmentary patterns also existing at the same time."

These conceptions are interesting from the point of view of the psychoses discussed here. They might apply in particular to those cases in which worry, emotional shocks, anxiety or toxic influences have been found to be precipitating factors. The case of Alzheimer's disease described by Lowenberg and Rothschild (1931), which showed a remission for 8 years, indicates that nerve-cell destruction cannot be gross in the early stages; that the dementia was a clinical finding, and was not based upon major pathological change.

In such cases it is possible that variations in the vascularity of certain areas of the brain are responsible for the onset of the mental symptoms, but at present it is difficult to see how such variations can produce the widespread parenchymal lesions which are characteristic of these conditions.

3. *Toxic Factors.*

Rothschild and Kasanin (1936) describe five cases of Alzheimer's disease in which no toxic, infectious or traumatic factor occurred in relation to the onset of the disease. They follow these with two cases showing evidence of toxicity at onset, and giving a clinical picture which they consider typical of a toxic psychosis. They do not regard these latter cases as suffering from Alzheimer's disease, in spite of the typical histopathological findings in one case.

It has been shown above, however, that there is no clear cut clinical picture of Alzheimer's disease. So that it can only lead to confusion if a condition having the typical pathological lesions is called toxic psychosis because the clinical findings are atypical. Therefore it is suggested here that all cases showing the typical pathological lesions should be regarded as examples of Alzheimer's disease, whether the condition was precipitated by a toxic process or not.

Rothschild and Kasanin object that in order to accept this view, a "latent

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form " of Alzheimer's disease must be presumed, which has not been reported in the literature. What they mean by a " latent form " is not quite clear, but presumably they are referring to the possibility of the parenchymal changes being present without disclosing any symptoms. This question has been referred to already in the section on pathology, where it was pointed out that the miliary plaques may be found in many conditions other than Alzheimer's disease and senile dementia. As will be shown below also, they occur frequently in psychotic patients over the age of 50 years.

Although, then, McMenemey (1940) has said that the importance of a toxic factor in Alzheimer's disease " cannot be minimized in certain cases," there is no evidence that such factors have more aetiological significance in the psychoses discussed here than in any other psychosis.

4. *The Choroid Plexus.*

The juvenile case of Malamud and Lowenberg (1929), in which there were marked degenerative changes in the blood vessels of the choroid plexus, drew attention to the possibility of such alterations being of aetiological significance in Alzheimer's disease. But, although degenerative changes are seen in this condition, these appear to be no more than would be normally found with advancing years, and the composition of the C.S.F. remains stable. Cowdry (1942), in fact, has remarked upon the stability of the blood C.S.F. barrier with old age, and finds changes in the C.S.F. almost negligible, while Rothschild (1937) found that, in senile psychoses, the choroid plexus lesions and the alterations in the permeability of the blood-C.S.F. barrier had no causal relationship to the parenchymal changes.

5. *Psychosomatic Factors.*

The suggestion has been put forward by Rothschild (1937) that a review of the whole personality of the individual might provide a key to the aetiology of senile dementia. White (1929) divided psychiatric patients into four broad groups, the paranoid, cycloid, schizoid and epileptoids. The first two groups he described as " compensatory," and the second two as " non-compensatory." His hypothesis was that from a psychogenic and somatic point of view, the compensatory types reacted to a stimulus, whereas the non-compensatory persons did not, or did so ineffectively. For instance, in the schizoid group the tendency was to become worse psychologically and to succumb to somatic diseases, such as tuberculosis. On the other hand, the paranoid group reacted vigorously by producing a delusional system, and such somatic diseases as malignant tumours and circulatory disasters. These he found occurred frequently in this group, and he considered them to be compensatory in character.

Arguing upon these lines, Rothschild suggested that the senile dement is a non-compensatory type. In his own series of cases of senile dementia he found that, although there were exceptions, there was evidence of correlation of reaction at the psychic and somatic levels, and that, on the whole, powers of compensation proved to be weak. So that, if White's hypothesis is valid, a

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review of the past history of the senile dement should disclose a tendency to schizoid or epileptoid traits.

If this is true of senile dementia, it should apply also to Alzheimer's disease. For here the patient is younger, and presumably more able to muster such compensatory faculties as are available. So that the fact that these patients succumb argues an even feebler power of reaction than in senile dementia. Certainly Rothschild and Kasanin (1936) and McMenemey (1941) remark upon the attempts at "rejuvenescence" in Alzheimer's disease, citing the motor unrest and some emotional changes as evidence of compensation, but the point is that these efforts are ineffective. It would be expected, therefore, that non-compensatory personality traits would abound in these patients. But, although these tendencies do not seem to have been specifically looked for in the cases reported in the literature, on reading the case-histories the impression is formed that compensatory and non-compensatory traits are equally likely to occur. Thus, of the seven cases reported by English (1942), all except two were "more or less extraverted, interested in other people, fulfilling their parts in personal and community social activities." And later he remarks, "introversion is conspicuous by its absence in this series." Also Case 4 had a previous attack of manic-depressive psychosis, a "compensatory" type of reaction.

On the other hand, Case 7 in this series had many features suggestive of schizophrenia, and was diagnosed as dementia praecox at one time. But this was a feature occurring after the onset of the illness, and the history showed no unusual personality traits.

The Rothschild and Kasanin (1936) Case 4, which was also schizoid in type clinically, had continued ill health in childhood and was presumably of an introverted type.

Again, the case of Jervis and Soltz (1936), although an early case of Alzheimer's disease, dying at the age of 42 years, showed no abnormal personality traits before the onset of the illness. He was said to be sociable, cheerful and even tempered, but appears to have been below the average level of intelligence.

Boyd's (1936) case was described as a "syntonic well-adjusted individual" previous to the onset of illness at 49 years.

Although lack of material makes any conclusion on this aspect of the aetiology impossible, it will be noted that miliary plaques tended to occur more frequently in paranoids and cycloids in the case material in this paper than in the schizoids and epileptoids—a finding exactly the opposite of what would have been expected on White's theory.

6. *Ageing.*

Many workers have remarked upon the tendency for miliary plaques to occur in the brain with advancing years, and have agreed that these appear inevitably provided that the subject lives long enough. Thus these plaques have become identified as marks of senility (Critchley, 1929, 1942), and the passage of time is regarded as an aetiological factor in their production. Roths-

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child (1937) has said, " With advancing age the brain shows an increasing tendency to the formation of plaques, but there may be other factors concerned in their origin, and these factors, though still unknown, are largely independent of age and may well differ from case to case." Here, then, is a definite suggestion that " advancing age " may be responsible for plaque formation, and that it is, at any rate, a factor in their production. Even if it is assumed that definite changes do occur in the brain as the result of ageing, there is still no evidence at present that the above suggestion is true, apart from the reports of Gellerstedt (1933), Critchley (1942) and others that miliary plaques occur invariably after the age of 90 years.

In fact, our knowledge of the changes in the central nervous system due to ageing, which has been reviewed by Cowdry (1942), does not show any evidence that plaques are being formed, with the possible exception of the alterations due to the ageing of colloids. Herbert Spencer explained the colloidal nature of the cell protoplasm, and spoke of the ageing of this substance as " an approach toward molecular equilibrium." This property of condensation with age was named " hysteresis " by Ruczicka, who described a progressive decrease of the electrical charges of the colloid particles, and dehydration. The result is a gradual loss of energy, and reduction of the total surface of the cell, so that metabolism is eventually brought to a standstill.

This conception was elaborated by Von Braunmühl (1932, 1934), who suggested that the miliary plaques are a secondary manifestation of these colloidal changes. But in his view the nervous system must be impaired first by exogenous and endogenous factors before the lesions can appear.

The fact that the pathological picture of senile dementia occurs also in association with normal senility was emphasized first by Tilney (1928), who said, " Thus it appears, from the clinical as well as from the anatomical standpoint, that senile dementia does not differ essentially from the ultimate state of normal old age except in its less (*sic*) rapid development."

Von Braunmühl tries to explain this by postulating these primary factors which are unknown. He says that the fundamental tissue alterations are more advanced in senile dementia, although the senile lesions, the secondary phenomena, may be no more prominent or even less so than in normal senility. This hypothesis has been aptly criticized by Rothschild (1937), who points out that since the primary lesions are undemonstrable, it is impossible to say whether they are more frequent in senile dementia or normal old age. Von Braunmühl therefore does not explain the presence of miliary plaques, but only suggests that some unknown factors in association with colloidal ageing may be responsible for them.

Many other workers have sought to explain the presence of plaques on a histopathological or histochemical basis. Their theories have been summarized by Hiroisi and Lee (1936), who describe twelve different hypotheses which have been advanced to account for them. As these authors point out, nearly all the known elements of the central nervous system have been held responsible for the formation of these plaques at one time or another. They themselves consider that they are the result of a mucoid degeneration of the oligodendroglia. It is safe to say that more work must be done upon this subject

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before the origin of the miliary plaques is known exactly. In the meantime, it seems premature to regard them as marks of age, especially when the process of ageing itself is so little understood.

The passage of time, however, does account for the death of the nerve cells, in that death is regarded as a normal accompaniment of old age. But in senile cases it is impossible to say how far the nerve-cell loss is due to the fact that the cells have reached "molecular equilibrium," and how far their death is the result of factors in the environment. In the "presenile" or younger cases, however, death of the nerve cells from old age must be considered abnormal. Yet it is this that seems to occur, for often there are no extrinsic factors demonstrable which could account for their death, and other parts of the body appear to be still comparatively young. If, then, they do die because they have reached their allotted life-span, the causative factor is an intrinsic one in the cell itself. It is suggested here that this is what occurs. If this is so, then the whole question of the aetiology of Alzheimer's disease and senile dementia is probably a genetic one. This matter is referred to again in the next section, and in the commentary on the case material.

Relationship with Normal Senility.

It appears from the above review of the literature that there can be no justifiable grounds for speaking of Alzheimer's disease and senile dementia as separate entities. For there are no significant histological differences between them; clinically there are no constant signs or symptoms on which they could be differentiated; and in both the aetiology is unknown. It seems unnecessary, therefore, to separate them solely on the grounds of age.

The condition known as "normal old age" has yet to be accounted for. It is well known that the pathological criteria of Alzheimer's disease are present also in extreme old age. But whereas in Alzheimer's disease and senile dementia the process is a relatively rapid one, and the soma and psyche react to the process of destruction in the central nervous system, in senility there is no such reaction, or it is minimal. One by one the nerve cells die, and one by one the plaques multiply in the brain while the other organs correspondingly decline. It seems as if the process of decay is integrated throughout the organism, no part is in advance of another, and hand-in-hand the various "systems" march along the road to oblivion. If trauma or infection do not intervene, the psyche slowly deteriorates until regression is complete.

The condition seems, therefore, to be nothing more than a death from inertia. The cells have lived their allotted span, and their electrical charges have reached an equilibrium.

The same process probably occurs in Alzheimer's disease and senile dementia. Research on the aetiology of these conditions has failed to produce any constant factor, as has been noted already. Possibly this is because it has been sought only in the environment and not in the cell itself. In other words, this factor is a genetic one, and it is interesting to note that Von Braunmühl (1931) has suggested that Alzheimer's disease is an heredo-degeneration.

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The problem, therefore, becomes one of genetics. It is not only the variations in the viability of the nerve cells in different individuals and families which have to be accounted for, but also the cause of these variations in the nerve cells relative to the other cells of the body.

These variations will be determined on the one hand by the genetic constitution of the individual, and on the other by the nature of the nerve cells themselves. For whereas many cells of the body can be replaced, and a particular organ kept functioning by such replacement, in the central nervous system, no such process can occur, and each nerve cell dead is an irreplaceable loss to the organism. Fortunately, the brain is endowed with an excess of these cells over its immediate wants. The organ is, therefore, able to retain its efficiency in spite of the loss of many members of the cell community. But there must come a time when the functions of the brain are impaired by these losses, and it may be that the increased work which the survivors are called upon to do may in turn accelerate their death, so that a vicious circle is set up.

If this hypothesis is correct, then Alzheimer's disease, senile dementia and "normal old age" are examples of the same condition occurring at different ages. In normal senility all the cells of the body have been genetically endowed with long life, and presumably the assaults from without have been minimal, or have been exceptionally well resisted. Streeter (1931), when discussing mortality tables, says that they become intelligible "if one accepts the point of view that there is an egg-determined life span and an egg-determined vitality of individual organs." It seems that, in persons who die of "normal old age," the "egg" must have been a good one.

On this hypothesis it might be expected that if the brains from a random group of persons coming to autopsy were examined, the histological features of Alzheimer's disease would be found in different stages of development. The findings would depend largely upon the age of the patient, and in some the lesions would not be sufficiently marked to produce symptoms, or the symptoms might be masked by those of the illness which had caused death. In a few cases, however, these changes in the brain would be fully developed, and then they might be the cause of the death of the whole organism.

The brains examined in the case material below were not strictly a random group. They were all inmates of a mental hospital, and all except seven were certified under the Lunacy Act. Thus no cases of normal senility were available. There is also the possibility that psychotic persons are peculiarly liable to hereditary taints, which express themselves in the central nervous system. So that a higher incidence of these histological changes might be expected in these persons than in those who were mentally normal.

Case Material.

The brains from 150 consecutive autopsies at a mental hospital were examined. The deaths occurred between 4.xi.38 and 30.xi.39, and the autopsies formed 94·6 per cent. of the total deaths occurring in the hospital in this period. All the cases were certified under the Lunacy Act, except seven, who were voluntary patients.

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Method.

As a routine measure, sections were taken from the frontal and occipital poles and from the cornu ammonis. In brains showing cortical atrophy elsewhere, further sections were taken from such areas. All sections were stained by Von Braunmühl's method of silver nitrate impregnation, as this showed both miliary plaques and neurofibrils particularly well, and was relatively rapid.

Cases in which small numbers of plaques with irregular distribution were observed were further investigated, sections being taken from the parietal, motor and sensory and temporal regions. Where, however, small numbers of plaques were evenly distributed throughout the areas examined, no further investigation was attempted, as this was taken to be a true indication of the degree of parenchymal change in that particular brain.

In addition, ten of the cases were more fully investigated. Methods used in these cases were those of Von Braunmühl, Hortega's silver carbonate and nitrate techniques, Cajal, Loyez, Bielschowsky, Weil, Weigert elastin, Mallory's aniline blue, Mallory's phosphotungstic acid haematoxylin, Weigert elastin and Van Gieson, haematoxylin and eosin, and the Nissl stain. In the majority of these ten cases the endocrine glands, the liver, spleen, kidneys, heart and aorta were also examined microscopically.

TABLE I.—*Incidence of Miliary Plaques and Neurofibrillary Changes in the Brains from* 150 *Consecutive Autopsies.*

	Age-groups.* 65–96. M.	65–96. F.	50–64. M.	50–64. F.	17–49. M.	17–49. F.	Percentage of total cases examined. M.	Percentage of total cases examined. F.	Total.
Large numbers of plaques with neurofibril changes	2	13	0	3	0	0	1·3%	10·6%	18
Small numbers of plaques with neurofibril changes	2	8	0	2	0	0	1·3%	6·6%	12
Large numbers of plaques without neurofibril changes	1	4	0	0	0	0	0·6%	3·3%	5
Small numbers of plaques without neurofibril changes	2	5	2	7	0	0	2·6%	8%	16
Neurofibril changes only	1	1	1	1	0	0	1·3%	1·3%	4
No plaques or neurofibril changes	5	8	15	28	16	23	24%	39·3%	95
Total cases examined	13	39	18	41	16	23	31·5%	68·5%	150

* "Age-groups" refers to age at death.

TABLE II.—*Plaque Incidence in Various Age-Groups.*

Age-group.	Total examined. M.	Total examined. F.	Without plaques. M.	Without plaques. F.	With plaques. M.	With plaques. F.
65–96	13	39	6	9	7 (54%)	30 (77%)
50–64	18	41	16	29	2 (11%)	12 (29%)
17–49	16	23	16	23	0	0

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Relationship Between Parenchymal Changes and Sex.

Reference to Table I shows that females : males examined were as 2 : 1 approximately. As is shown in Table II, however, four times as many females showed miliary plaques in the senile age-group, and six times as many in the presenile age-group. Moreover, amongst the males examined in the senile age-group, only 7 (54 per cent.) show parenchymal changes as against 30 (77 per cent.) of the females. Also, reference to Table I shows that of these 7 (54 per cent.) males, only 2 (28 per cent.) had maximal changes quantitatively, whereas in the like group of females, 13 (43 per cent.) had large numbers of plaques and neurofibrillary alterations.

In the presenile age-groups the preponderance of miliary plaques in the females is even more striking. For the 2 (11 per cent.) males in this group who showed any parenchymal changes at all did so in minimal amounts, but of the 12 (29 per cent.) females, 3 (25 per cent.) had a maximal amount of parenchymal change. In this series of cases, therefore, the incidence of parenchymal changes is considerably greater amongst the females than the males.

Comment.

The findings suggest that these histological changes occur in the brain at an earlier age in females than in males. This observation is borne out by the preponderance of females over males in the reported cases of Alzheimer's disease. Rothschild (1934) gives the incidence of females : males as 3 : 2. Mayer-Gross (1944) says, "A completely unexplained feature of Alzheimer's disease is the prevalence of females."

It has been suggested elsewhere in this paper that the primary aetiological factor in Alzheimer s disease is a genetic one. If this is so, then the prevalence of these findings in females can be explained along the lines indicated by Penrose (1942). He points out that harmful dominant mutations which produce their effect before or in the reproductive period tend to be eliminated by the effect of natural selection, because in these individuals fertility is reduced. Recessive mutations, on the other hand, and dominant ones which produce their effect after the reproductive period are less susceptible, because fertility is not affected.

Slater (1944) has pointed out that some of the familial cases of Alzheimer's disease which have been reported suggest a fundamentally dominant mode of inheritance. At the same time there seems no doubt that the effect is produced normally after the reproductive period (Table I). If it is assumed, then, that the mode of inheritance is dominant and that the effect is produced after the reproductive period, the degree of postponement will be greater in the male than the female as the former has a potentially longer reproductive life. It would be expected, therefore, that these histological changes in the brain would be found at an earlier age in females than in males.

Relationship between Presence of Miliary Plaques and Type of Psychosis.

1. *Affective Psychosis.*

Table III shows that of the 76 cases of affective psychosis, nearly half (32 cases) showed miliary plaques, or neurofibrillary changes, or both, in the brain

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at autopsy. But of these 32 cases, 13 were under 65 years at death, and so may be considered to have developed parenchymal changes in the brain at a comparatively early age.

TABLE III.—*Incidence of Miliary Plaques and Neurofibril Change in Different Types of Psychosis.*

	Total number of cases.	Cases showing plaques or neurofibril changes, or both.		Cases showing large numbers of miliary plaques with or without neurofibril changes.
		Number.	Age-group.*	
Affective psychosis	76	32	50–89	7
Schizophrenia	19	2	52 and 60	0
Paranoid psychosis	7	4	63–77	0
Idiopathic epilepsy	9	2	71–84	2
General paralysis of the insane	14	0	—	0
Imbecility	2	0	—	0
Organic dementia	23	15	58–96	14

* "Age-group" refers to the age at death.

(a) *Cases Under 65 Years at Death with Miliary Plaques Present.*

Some details of these cases are set out in Table IV. It will be seen that in the majority the lesions are present in small numbers only and are locally distributed. Plaque incidence is greatest in the hinder parts of the brain, in conformity with the opinion of Mayer-Gross, who considered this a feature of

TABLE IV.—*Thirteen Cases Diagnosed as Affective Psychosis Showing Parenchymal Changes in the Brain at Death under 65 Years.*

Case number.	Age at death.	Sex.	Distribution of parenchymal changes in brain.
19	53	F.	Miliary plaques in occipital, frontal and temporal cortex and insula.
49	62	F.	Plaques in small numbers present everywhere in cortex and neurofibrillary changes in hippocampus.
56	54	M.	A few instances of neurofibrillary changes in hippocampus. No plaques.
68	58	F.	Plaques present everywhere in cortex, most in frontal. No neurofibrillary changes.
75	57	M.	A few plaques in dentate gyrus.
80	64	F.	Many plaques in occipital region, some in cornu ammonis.
88	60	M.	Small numbers of plaques in occipital region.
97	52	F.	Small numbers of plaques in hippocampus only.
123	58	F.	Plaques present everywhere in cortex. No neurofibrillary change.
124	63	F.	Small numbers of plaques in occipital region and lingual gyrus only.
127	62	F.	Moderate numbers of plaques in cornu ammonis only.
134	52	F.	Small numbers of plaques in frontal region only.
146	50	F.	Moderate numbers of plaques in occipital region and cornu ammonis.

Alzheimer s disease. The exceptions are Cases 62, 123 and 134. In Case 62, however, the plaques are present in the post-central gyrus as well as in the frontal gyri. In the post-central gyrus they are few and widely scattered, but in the frontal region they are more numerous, particularly in the superior frontal gyrus.

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With the exception of Cases 49 and 56, no instances of neurofibrillary loops and tangles were observed. In view of the small numbers seen in Case 56 and the possibility of artefacts this case can be ignored. Cases 19 and 146 were complicated by the fact that the former had syphilis and the latter a carcinoma.

(b) *Cases Over 65 Years at Death with Miliary Plaques Present.*

Seven cases showed large numbers of miliary plaques in the brain at death. Their ages are shown in Table V. They call for little comment except Cases 65 and 71, which will be reported in more detail. Clinically they were typical of a chronic mania with slowly progressive dementia. The course varied between 20 and 50 years.

TABLE V.—*Seven Cases with Clinical Diagnosis of Affective Psychosis, showing Large Numbers of Plaques in the Brain at Death.*

Case number.	Sex.	Age at onset.	Age at admission to hospital.	Age at prior attack.	Age at death
3	M.	58	66	*Nil*	75
26	F.	55	55	46	78
65	F.	63	65	39, 62	80
71	F	26	40	26	73
79	M.	50	50	Not known*	84
122	F.	40	41	Not known	80
139	F.	67	67	27, 50	81

* A prior attack was reported.

The personal histories showed that prior attacks had occurred in three of the cases (Table V). No family history was available in three cases. Case 3 had seven children, of whom two were certified in a mental hospital, while Case 139 had a brother who was an epileptic. In Case 71 there was said to be insanity in the family on the maternal side.

From a pathological point of view there were few notable differences. The bodies were all thin and wasted. Case 26 also had contractures of the legs, and Case 3 a large gangrenous area on the right leg reaching from knee to ankle. Arteriosclerosis was present everywhere and was far advanced, and there were secondary arteriosclerotic changes in all the organs. There were no other pathological findings of importance. The brains did not show any marked cortical atrophy and their weights ranged from 1,110 gm. to 1,440 gm. Miliary plaques were profuse, the frontal areas having definitely greater numbers than the occipital regions, in contrast to the cases in the preceding section. Neurofibrillary loops and tangles were present in small numbers in five of the cases. In Case 139 there were calcified areas on the larger arteries throughout the body, and small areas of softening could be seen in the basal ganglia of the brain with the naked eye. Arteriosclerosis was regarded as the cause of death in all these cases.

There can be no doubt that hereditary factors played a large part in the deterioration, both mental and physical. They developed an affective psychosis upon which an arteriosclerotic dementia was imposed. At the same time

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further evidences of a degenerative process in the central nervous system are found to be present after death. Although miliary plaques, and in some cases neurofibrillary loops and tangles, are found in great numbers, it is impossible to say how far these are responsible for the clinical condition, or even whether they have had any influence at all upon the symptoms. As similar findings have been described in younger cases, it is suggested that the Alzheimer changes have progressed slowly over a great number of years, and that their effects have been masked by the psychosis and the arteriosclerosis.

(c) *Cases Over 65 Years of Age at Death without Miliary Plaques.*

There were three cases, and from a clinical point of view the preservation of the intellectual faculties is well marked, in contrast to the preceding group of cases (I.B.). Thus Case 98 was reported, six months before his death, to be an exceptionally good player of draughts, and except for some defect of memory in Case 30 there was no evidence of dementia. The fact that depression predominated in this group while excitement was most apparent in the cases of group I.B. is probably a coincidence.

Pathologically, the most striking difference between the two groups is the presence of miliary plaques in the first group only. It is tempting to account for the dementia in these cases by their presence. But there are other differences which might equally well be responsible. In Case 22, for instance, the cerebral vascular system was well preserved. In Cases 30 and 98, although the cerebral arteriosclerosis was well advanced and comparable in many ways with these changes in group I.B., it is impossible to compare the degree of nerve cell destruction in the two groups of cases, or to say how much the association fibres were interfered with, or the tracts to and from the higher centres.

Thus, although Cases 65 and 30 were superficially similar from the point of view of vascular disease and hypertension, yet there were essential differences in the distribution of the cerebral lesions. In Case 65 the major areas of softening were in the basal ganglia and thalamus, while in Case 30 these lesions were present in the cortex rather than the subcortical regions. Plainly, therefore, the former case would be more likely to show gross forms of dementia. At the same time it should be remembered that miliary plaques are associated, in the cases of Alzheimer's disease and senile dementia, with an extensive destruction of the cortical neurones, and that this is regarded as the pathological basis of the intellectual deterioration. It is likely, therefore, that a similar association occurs in the senile cases, and that whatever miliary plaques occur, a corresponding destrruction of nerve cells is present over and above any that may be destroyed from vascular causes. How far the disappearance of cortical neurones is due to arteriosclerosis and how far to factors which also produce miliary plaque formation it is impossible to say.

2. *Idiopathic Epilepsy.*

All except two of the nine epileptics in this series died at an early age. One died at 25 years, one at 39 years, four in the fourth decade and one aged 59 years. Only in Cases 44 and 129 were any miliary plaques or neurofibrillary

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changes seen, and these two died at 71 and 84 years respectively. There is no reason to suppose, therefore, that epileptics are peculiarly liable to the parenchymal lesions of Alzheimer, or that idiopathic epilepsy has any influence upon the development of this condition.

3. *Paranoid Psychosis.*

Most of these seven cases lived to a greater age than the schizophrenics, and the histological features of Alzheimer's disease were correspondingly more frequent. Three cases over 70 years at death all had miliary plaques in the brain post-mortem, and two of these had neurofibrillary changes also. Case 131, aged 63 years at death, had small numbers of neurofibrillary baskets in the cornu ammonis without plaque formation.

In no case were the miliary plaques frequent. In Case 91 they were scattered through the frontal cortex and cornu ammonis, and there was a similar distribution in Case 132, which had neurofibrillary changes present in addition. A carcinoma was present in each of these cases, in the former in the right breast, in the latter in the rectum. Although these cases showed a considerable degree of dementia, this was regarded as of vascular origin and well advanced cerebral arteriosclerosis was found post-mortem. They died at the age of 70 and 77 years respectively. The carcinomata were the cause of death.

In Case 10 miliary plaques were present in the cornu ammonis only, and here there was also well-marked neurofibrillary change. There was little clinical evidence of dementia, and the patient died at the age of 72 years from a pyelonephritis and perinephric abscess.

These cases are, therefore, similar to those of the affective psychoses, who showed the characteristic pathological features of Alzheimer's disease developing with advancing years.

4. *Schizophrenia and Imbecility.*

Out of nineteen cases of schizophrenia (Table III), only two showed miliary plaques in the brain post-mortem. The plaques were present in small numbers only and were widely scattered. No neurofibrillary loops or tangles were seen.

In this group all cases died comparatively young, and only three lived beyond the age of sixty years. Cases 46 and 55, aged 60 and 52 years respectively at death, were those which had miliary plaques post-mortem. Two cases, aged 71 and 66 years at death, showed no evidence of plaque formation.

Although the number of cases is small, these figures suggest that the parenchymal lesions in the brain would be found in similar distribution amongst schizophrenics and cyclothymes, and that the type of psychosis had no aetiological significance.

There were two cases of mental deficiency. Both died at a comparatively early age, and no plaques or neurofibrillary changes were found in the brains. Case 15 died of lobar pneumonia and a pneumococcal meningitis, aged 31 years. Case 112 died from a lobar pneumonia, aged 43 years.

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5. *General Paralysis of the Insane.*

There were an unusual number of deaths from this disease. All the cases, however, except one died before the age of 60 years. Case 30 lived till he was 61 years old. In no case was any evidence of miliary plaques or neurofibrillary change seen. It is presumed, therefore, that syphilis cut short the life of the individual before the central nervous system had time to develop these parenchymal changes.

It is noteworthy that no cases of miliary plaques occurring in general paralytics have been recorded in the literature, except by Struwe (1929), who mentions that he found them repeatedly in " old paralytics." No other indication of the age of these persons is given. It would appear, therefore, that the syphilitic toxin, at any rate, is not one which has any influence upon the formation of the plaques.

6. *Organic Dementia.*

In this series of cases there were twenty-three which were diagnosed as organic dementia (Table III). Some details of these are set out in Table VI. It will be observed that fourteen of these cases had large numbers of miliary plaques in the brain post-mortem. The question of diagnosis immediately arises.

Case 6, diagnosed as arteriosclerotic dementia, died of a cerebral haemorrhage. Arteriosclerotic changes were well marked in the brain, and there was a small recent haemorrhage into the right lentiform nucleus and a large and older one into the left lentiform nucleus. In every part of the cortex examined, however, there were enormous numbers of miliary plaques, and the neurofibrillary tangles of Alzheimer were prominent. A diagnosis of Alzheimer's disease or arteriosclerotic dementia was equally suitable in this case, but there is no doubt that it was the second which killed the patient.

Cases 25 and 67 present a similar problem, but here the miliary plaques were not quite so numerous, and no neurofibrillary tangles were seen.

The diagnosis between Alzheimer's disease and senile dementia is arbitrary in the extreme. Case 121, with age of onset at 60 years, is called Alzheimer's disease. No neurofibrillary changes were noted in this case, the duration of the illness being approximately six and a half years. But Case 126 is termed senile dementia because the onset was at the age of 66 years and the total duration about nine years. Neurofibrillary tangles were present in large numbers.

Case 150 is diagnosed as senile dementia, yet the onset of the disease at 64 years would be considered by many to be in the presenium. But the total duration is twenty-one years, and the patient died aged 85. It has been pointed out already that a course of twenty years in Alzheimer's disease has been described by other workers. Neurofibrillary tangles were present in small numbers in this case. Case 138 provides a similar argument.

The fourteen cases with miliary plaques showed dementia as the most prominent symptom, but they could be classified according to Critchley's (1942) subtypes. Nine were of the confusional type, three had depressive

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TABLE VI.

Case number.	Sex.	On admission. Age.	Diagnosis.	Date.	Duration of illness before admission.	Autopsy.	Revised diagnosis.	Miliary plaques.
6	M.	66	Arteriosclerotic dementia	22.ix.38	6 years	18.xi.38	Arteriosclerotic dementia	+++
14	F.	65	,, ,,	29.ix.38	4 weeks	22.xii.38	,, ,,	o
24	F.	65	,, ,,	10.x.38	3 months	13.i.39	,, ,,	o
25	F.	61	Dementia with epilepsy	27.xi.19	1 year	14.i.39	,, ,,	++
40	F.	70	Senile dementia	23.i.39	6 years	13.ii.39	Alzheimer's disease	+++
42	M.	54	Arteriosclerotic dementia	22.xi.27	2 ,,	20.ii.39	Arteriosclerotic dementia	o
61	F.	60	,, ,,	20.vii.37	3 days	4.iv.39	,, ,,	o
67	F.	65	,, ,,	5.v.26	2 years	14.iv.39	,, ,,	++
77	F.	43	Melancholia	1.vii.15	1½ ,,	10.v.39	,, ,,	+
105	F.	55	Cerebral tumour	7.xi.38	2 ,,	7.ix.39	Meningioma	o
106	M.	65	Senile dementia	28.iv.39	Unknown	11.ix.39	Arteriosclerotic dementia	o
108	F.	84	,, ,,	11.iv.32	5 years	14.ix.39	Senile dementia	+++
109	F	83	,, ,,	6.xi.36	3 ,,	15.ix.39	,, ,,	+++
113	F.	77	,, ,,	10.vii.39	3 months	21.ix.39	Arteriosclerotic dementia	o
118	F.	75	,, ,,	15.vi.39	2 years	29.ix.39	Senile dementia	+++
121	F.	66	Alzheimer's disease	21.iii.39	6 years	14.x.39	Alzheimer's disease	+++
125	F.	60	,, ,,	6.ix.39	3 ,,	18.x.39	,, ,,	+++
126	F.	69	Senile dementia	6.ix.33	3 ,,	20.x.39	Senile dementia	+++
130	F.	56	Alzheimer's disease	30.xii.35	3 ,,	27.x.39	Alzheimer's disease	+++
138	F.	83	Senile dementia	29.iii.26	20 ,,	4.xi.39	Senile dementia	+++
142	F.	79	,, ,,	26.x.39	Few weeks	19.xi.39	,, ,,	+++
145	F.	63	Arteriosclerotic dementia	13.iii.39	1½ years	27.xi.39	Arteriosclerotic dementia	o
150	F.	65	Senile dementia	11.vi.19	1 year	30.xi.39	Senile dementia	+++

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symptoms, and two were manic. None could be reasonably termed paranoid. Table VII gives the case numbers under the appropriate headings.

The five who had depressive or manic symptoms were very similar to those cases of affective psychosis with secondary dementia, which were described above. They could be said to differ, perhaps, in three ways: First, they were all over the age of 65, except Case 25, on admission, and dementia was well marked already at this time. Second, no history could be obtained of a prior attack of mental illness necessitating admission to hospital, although the present illness had been in existence for several years in most cases. Thirdly, the parenchymal changes in the brain were more profuse possibly in these cases than in those classified as affective psychosis.

Further details and discussion of these cases must be left to another paper.

TABLE VII.

Predominating symptom.	Age-groups on admission. 50–60.	61–70.	71–80.	81–100.	Total.
Confusion	125	6 67	118	—	—
	130	126 150	142	109	9
Excitement	0	40	0	138	2
Depression	25	121	0	108	3
Delusions	0	0	0	0	0

DISCUSSION.

The examination of this series of brains confirmed the suggestion, put forward as the result of the review of the literature, that the parenchymal lesions associated with Alzheimer's disease would be found in various stages of development in different cases. They were found in the majority of the cases who were over 65 years of age at death, and in many cases in the 50 to 60 age-group. In some cases the lesions were so profuse that a diagnosis of Alzheimer's disease or senile dementia was considered, and again it was found that no clinical, pathological or aetiological features were present to distinguish the two conditions, so that either diagnosis appeared equally suitable.

This discovery in the case material of instances where the parenchymal changes in the brain were in process of development seemed significant also from another point of view. For where the lesions were few, they did not give rise to any symptoms. It seemed that they must be profuse in some particular area of the brain before they affected the clinical picture, and usually this area was the frontal cortex. Further, the symptoms, when they did appear, seemed to be of "organic" origin rather than "functional." This suggested that the parenchymal changes of Alzheimer's disease always gave rise to an "organic syndrome," and that "functional" signs and symptoms must be explained in some other way when they appeared in this disease. Rothschild and Kasanin (1936), in speaking of Alzheimer's disease, have said, "In our experience the diagnosis can be made with a fair degree of certainty in the majority of instances if one remembers that the core of the clinical picture is formed by a definite "organic syndrome." It is suggested here that this "core" is alone the clinical picture of Alzheimer's disease, and that where "functional" symptoms

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occur these may be accounted for in two ways. First, it has been shown in the case material in this thesis that the pathological picture of Alzheimer's disease may occur in cases of other psychosis. But it is well known that it may occur also in normal persons in old age. In these cases it has therefore no connection with the psychosis in which it occurs and is superimposed upon it. There is no difficulty in accepting this if it is admitted that Alzheimer's disease is not strictly a "disease" but is connected with the process of ageing, unless one agrees with Warthin (1929) that ageing is itself a disease.

Secondly, if these lesions in the brain occur in persons who are otherwise still comparatively young, it may be supposed that they retain some insight into their condition in the early stages, and that they realize that they are ill.

The same may be true of those cases in which the parenchymal changes develop rapidly in the brain. In normal senility the process is such a slow one, the mental deterioration is so gradual that the patient himself never realizes that there is any change, until he becomes so confused mentally that he is no longer capable of appreciating it. But if the patient suddenly finds that his memory is failing; that he no longer understands what is said to him, or does so imperfectly; that people do not seem to follow what he means when he speaks; that he has difficulty in expressing himself; then he may develop mental symptoms. The character of these symptoms will depend upon the degree of fear which he feels at his appalling plight, and the nature of the reaction of his personality to this fear. It is interesting to note that English (1942) has explained the depression, which he found in some of his cases of Alzheimer's disease, on these lines.

In accounting for the "functional" symptoms as opposed to the "organic" in Alzheimer's disease and senile dementia, there are then these two possibilities: in the first the functional symptoms are the expression of a psychosis unrelated to Alzheimer's disease or senile dementia, but the lesions characteristic of these conditions develop in the course of the illness and are superimposed upon it. In the second the "functional" symptoms result indirectly from the parenchymal lesions in the brain, and form, as it were, a secondary system and are dependent upon the personality of the patient for their quality and quantity.

If these views are accepted, then the wide variations in the clinical picture of Alzheimer's disease and senile dementia, which have been reported in the literature, and confirmed in the case material in this thesis, can be explained. In the majority of cases they are due to the fact that the pathological lesions in the brain have occurred during the course of some psychosis. In many instances, in fact, the patient has had a previous attack of this psychosis and made a partial or complete recovery. This may account for some of the "remissions" which are described in the literature, and attributed to a halting of the pathological process of Alzheimer's disease. No biopsies have been done in such cases, so that it is impossible to say whether the lesions were in fact present at all at the time.

Since the commonest types of psychosis are the affective ones, the histological changes described by Alzheimer may be expected to co-exist most frequently with these types, especially as they are particularly prevalent amongst

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persons at the age of involution. This expectation was confirmed by the case-material in this thesis. If the commonest type of personality is the syntonic or cyclothymic, those cases which retain insight after the development of the lesions in the brain may be expected to react most frequently with excitement or depression.

Certain cases from the literature will illustrate these conclusions. Lowenberg and Rothschild (1931), Case 2, for instance, might well have been a manic-depressive psychosis in which the lesions of Alzheimer's disease were superimposed at a date after the onset of the psychosis. This was the case in which the patient had a remission of eight years, which she spent at home, and gave birth to a normal child. On the other hand, Malamud and Lowenberg's (1929) Case 2 was typically one of schizophrenia. It is possible that the disease of the choroid plexus accelerated the formation of plaques and neurofibrillary changes in the brain, and resulted in the appearance of these post-mortem at the age of 23 years.

It would appear, therefore, that Alzheimer's disease is a condition which may occur at any age. It has a definite pathology, giving rise to a definite clinical picture of an organic syndrome. The aetiology is obscure. In the past the condition has been known as " Alzheimer's disease " when it occurred during the individual's earlier years ; " senile dementia " when it appeared in the senium, and developed rapidly when compared with the gradual intellectual deterioration of normal old age ; and simply " senility " when it progressed so slowly amongst the aged that the gradual physical and mental decline was considered normal. In the first two the central nervous system has aged before the rest of the body, or else more rapidly. In the last there has been a parallel decline throughout the various systems of the organism. It must be confusing to retain three different names for the same process. Yet " Alzheimer's disease " seems inappropriate, for it is at least questionable whether the condition is strictly a disease, and " senile dementia " implies an association with senility of the whole organism, which does not necessarily occur. Here it is suggested that " Alzheimer's dementia " might be a better term to describe this syndrome.

Conclusion.

The formation of miliary plaques in the central nervous system and ganglion cell destruction are the pathological criteria of Alzheimer's disease, senile dementia and senility.

The clinical features are those of an organic syndrome, but these do not become apparent until the later stages of the disease, and are frequently concealed by the mental reactions of the patient, or by coexisting mental illness.

These dementias seem to be related to the process of ageing. But whereas ageing seems to be occurring abnormally early in the central nervous system in Alzheimer's disease and senile dementia, in senility it is integrated with the ageing process in other parts of the body, and so can be considered " normal."

It is pointed out, however, that it is premature to regard the presence of miliary plaques as marks of age.

It is suggested that as genetic factors are concerned in the process of ageing,

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they may account for the variations in the age of onset of those changes in the central nervous system, and in their relative preponderance in females. The term Alzheimer's dementia is suggested to describe this organic syndrome.

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GENETICS IN RELATION TO MENTAL DISORDERS.*

By FRANZ J. KALLMANN, M.D.

DESPITE the precarious vulnerability of genetic theories to partisan distortion and abuse, a report on the progress of genetics in relation to mental disorders merits introduction on a fairly optimistic keynote. It seems that in quest of a better understanding of human behaviour deviations we have finally arrived at the threshold of the age of biology as a focal discipline. There are many indications that in searching for adequate methods of biological analysis, one of the key positions of science is held by *human genetics*.

Built on the earlier pioneer work of British biologists, the knowledge of human heredity has steadily advanced in recent years. Much of this advancement was due to the methodic investigations carried on in the laboratories of this country. The progress extended to many of the medical problems of genetics, especially to those concerning mental deviations. As a psychiatrist who has long been interested in the genetic principles of human personality disorders, I fully appreciate the opportunity to be with you at this conference.

In an unbiased analysis of the potential effects of genic elements in the causation of psychopathological manifestations, one may safely proceed on the premise that basically uniform patterns in the organization or disorganization of *mental capacities* are controlled by heredity in the same manner as are those underlying the normal or abnormal developments of physical traits. From a psychogenetic standpoint, the capacity for maintaining a state of mental health is a complex biological phenomenon and not merely the equivalent of the providential absence of emotional strain exerted by the prevalence of social imperfections in the structure of modern society. At all times this capacity constitutes an integral part and central driving force of human personality development. Its existential effectiveness rests upon the individual ability to conduct a multitude of psychosomatic functions with a relative degree of vital efficiency.

Despite the rather dogmatic claims of some modern evolutionists, the *biological process of personality integration* never ceases to be subject to the laws of organic existence and structural growth. No aspect of this developmental process can be assumed to occur either by chance or by instinct. Differences in terminology do not alter the fact that the possession of instinctive energies at birth depends on the capacity for maintaining organic life, which must have begun to function before it lends itself to interpretation as to its psychological meanings and social consequences. Beyond question there would be no vital energy in any infant unless it had been produced by the operation of a complicated genetic process. It is equally certain that there is no evidence either for a self-perpetuating form of human culture that could exist in a biological

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vacuum or for any evolutionary differentiation of behavioural responses without the organic means of expressing behaviour.

For the purposes of descriptive convenience it is perfectly legitimate, of course, to distinguish between instinctual generality and acquired specificity of human behaviour, or between the separate effects of organic and social inheritance, or between specialized fixity and adjustive plasticity of mental traits. Psychologically oriented biologists may also be correct in stressing that behavioural plasticity of the human mind represents the most typical and uniquely human characteristic. There are no intransigent objections to such a generalized formulation, even if one may find it difficult to concede that "social organizations on the human level are built on the principle that an individual is able to alter his behaviour to fit any situation, whether previously experienced or new" (as has recently been claimed by the same group of writers). In fact, human personality development is so intricate a process that it permits description of the multiformity of its existential expressions on many organizational levels of appearance in the organic world.

Genetically, however, there are definite limitations to the candid or disguised tendency to think of behavioural responses of man pre-eminently in terms of *culture-personality problems* "emancipated from dependence upon inherited biological dispositions." Regardless of the degree of evolutionary emancipation achieved, mental behaviour of any kind remains a structural function of the organic nervous system. The ability to be mentally adjusted as well as the ability to react to "unadjustable" circumstances with a true psychosis must be regarded as a unique expression of the attainment of human status in the evolutionary development of man's mental equipment and cultural setting. These abilities depend basically on the common denominator of hereditary potentialities, since it can be shown without difficulty that similar mental reactions of a normal or psychopathological variety are produced by similar environmental circumstances only in a certain number of the persons exposed to them. One may say that both the tendency to become vulnerable to the destructive effect of a schizophrenic or manic-depressive psychosis and the capacity for maintaining a mentally adjusted life, despite biological and cultural imperfections, are interdependent indications of the genetically controlled inability of man to attain superhuman status emancipated from the bondage of organic inheritance (at least, till the end of the academic summer season 1947).

This statement does not mean, of course, that a person is "born" a schizophrenic or a manic-depressive, or that all carriers of either gene constellation will actually develop the trait as a matter of fate. From a genetic standpoint, the term "hereditary" applies to any mental disorder that would not originate without the presence of a certain gene combination. The implication is that some persons *have* the genetic capacity for reacting to precipitating stimuli with either a schizophrenic or a manic-depressive type of psychosis, while others *have not*. Whether or not a real psychosis will be developed by such a "predisposed" person usually depends on an intricate interplay of constitutional and environmental factors.

The effect of *environmental agents* may be instrumental in bringing such a

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psychotic state to the foreground, but it should not be assumed that the suppression of an unexpressed or only mildly expressed genotype must necessarily be due to the action of purely environmental influences. Very frequently protection by other genetic background factors in a person distinguished by a strong constitution may be more important than the accidental absence of deleterious elements in the environment. In any case, there is no known constellation of plainly environmental circumstances that would produce a true schizophrenic or manic-depressive psychosis in persons who do not have a specific predisposition for either condition.

The *specific nature of the respective genes* is indicated by the observation that the incidence of schizophrenia is increased in the twin partners and other blood relatives of schizophrenic twin index cases, and that of manic-depressive psychosis in the consanguinity of manic-depressive index cases. No twin pair has as yet been found with a schizophrenic psychosis in one member and with a manic-depressive psychosis in the other, if a consistent system of classification is used. Another truism is that even of those blood relatives of a schizophrenic or manic-depressive patient who share exactly the same environment with a psychotic brother or sister or parent, only a limited number develop a psychosis. The others seem sufficiently protected against a schizophrenia- or depression-producing environment by the fortuitous absence of a specific genetic predisposition.

The statistical evidence in support of the *genetic etiology of schizophrenia* centres around the well-established fact that the disease occurs much more frequently in families which include a known case of schizophrenia (called an index case or proband in family studies) than it does in the general population, that is, in any group of persons who are not distinguished by blood relationship to such an index case. The average expectancy of schizophrenia in a general population without a pronounced tendency to inbreeding is less than 1 per cent. —0·85 per cent. to be exact.

However, the children of one schizophrenic parent have a probability of developing the disease nineteen times that of the general population. The grandchildren and the nephews and nieces are about five times more likely to show a recurrence of schizophrenia than is the average person. The schizophrenia rate of the parents of schizophrenics approximates 10 per cent. The expectancy for brothers and sisters as well as for the fraternal twin partners of schizophrenics is somewhere around 14 per cent., while that for half-siblings is about 7 per cent., and that for step-siblings, 1·8 per cent. The highest morbidity rates are found among the children of two schizophrenic parents, who have about 80 times the average expectancy, and among the identical twin partners of schizophrenic index cases, who show an expectancy rate of 85 per cent.

This distribution of schizophrenia rates indicates clearly that the chance of developing a schizophrenic psychosis increases in direct proportion to the degree of blood relationship to a schizophrenic index case—a rather convincing proof of the operation of heredity. It may be added that the morbidity rates quoted were obtained in two surveys with a total of over 1,800 schizophrenic index cases, of which 794 were born as twins, while the others were single-born.

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The families of the index cases studied included a total number of about 20,000 consanguineous persons, who were uniformly classified according to their mental, social and genealogical conditions.

Regarding the morbidity rate of 85 per cent. for the monozygotic partners of schizophrenic twin index cases, it may be borne in mind that the figure expresses the chance of developing schizophrenia in a comparable environment for any adult person that is genetically identical with a schizophrenic index case, but is not distinguished by the fact of having been selected as the child of such an index case. The latter qualification needs particular emphasis, since it apparently explains the difference found between the schizophrenia rates for the two identifiable groups of potential homozygotes of the schizophrenic genotype, that is, the children of two schizophrenic parents and the monozygotic co-twins of schizophrenic index cases. These two groups differ considerably in their morbidity rates, which amount to about 65 and 85 per cent. respectively. It is only by an analysis of this difference that a satisfactory estimate can be obtained of the extent of biased sampling in a morbidity study dealing with children of schizophrenic index cases. In order to provide such a sample, schizophrenics must have had a chance of getting married and of having offspring.

It has been shown by various fertility studies that the total reproductive rate of schizophrenic index cases is not more than about half that of a comparable general population. It is also known that the decrease in fertility is especially pronounced in the deteriorating types of schizophrenia. The consequence is that milder schizophrenic cases have a better chance of reproducing a schizophrenic child than have the more severe cases. If the children of one schizophrenic parent will often be the offspring of patients with lessened severity of their symptoms, the children of two schizophrenic parents may be expected to represent an even greater selection of potential schizophrenics in the direction of a more highly resistant constitution. Such a selective process does not operate in persons who have only the distinction of being the monozygotic twin partners of schizophrenic twin index cases. From the standpoint of disease expectancy, therefore, it is preferable for a potential schizophrenic to have two schizophrenic parents rather than one identical schizophrenic twin.

Statistically no less conclusive is the finding that all the observed variations in the schizophrenia rate are correlated with *different degrees of consanguinity* to a schizophrenic index case, but not with similarity or dissimilarity in the respective *environments* of the twin partners and other siblings of schizophrenics. About one-quarter of one-egg twin pairs show concordance as to schizophrenia without similar environment, while close to one-half of two-egg twin pairs remain discordant, even if the two twins have been exposed to precisely the same environment. This observation excludes the possibility of explaining the difference in morbidity between one-egg and two-egg co-twins on non-genetic grounds, that is, by a simple correlation between closeness of blood relationship and increasing similarity in environment.

The hypothesis of *recessive inheritance* in relation to the unit genotype of schizophrenia is borne out by the taint distribution in schizophrenic index

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families, showing transmission in the collateral rather than in the direct line of descent, and by an excess of consanguineous marriages among the parents of schizophrenic index cases. In two of our surveys about 5 per cent. of the index cases originated from consanguineous parental matings. Preferential support for a dominant type of inheritance was probably motivated in part by an endeavour to justify a compulsory sterilization program for schizophrenic patients. Considering the common occurrence of schizophrenia and the noticeable effect of inbreeding in certain population groups, it seems safer all around to assume that a true schizophrenic psychosis of any variety can be developed only by a homozygous carrier of the predisposition. Schizoid personality types may be either homozygotes with effective resistance to the expression of the genotype, or heterozygotes with strongly reduced resistance.

According to many observations in schizophrenic twin pairs and other sibship groups, the *variations in the clinical appearance* of the single-recessive unit factor for schizophrenia range from the mildest to the most destructive forms of the disease. The clinical variations include the episodic syndromes of a simple or catatonic variety as well as the chronic and strictly progressive forms of paranoid or hebephrenic colouring. Therapeutically it is especially important that the expression of the genotype may be fully suppressed under certain conditions. Such frustrated homozygotes may be either schizoid in personality or completely normal in outward appearance.

These differences in the phenotypical expressions of the genotype appear to be controlled by a *constitutional defence mechanism*, which is probably non-specific genetically, and certainly multi-factorial in that portion which is determined by heredity. There is a wide range of graded variations in the ability to resist the development, or to counteract the progression, of a schizophrenic psychosis. This ability has been shown by the results of biometric studies to be correlated somehow with the morphological development of mesodermal elements. The most useful correlative indicators of the constitutional capacity for mobilizing effective mesodermal defence reactions still consist in the measurements of the athletic component of physique and in the ability to maintain a stabilized level of body weight.

Our material of monozygotic twin pairs abounds with cases in which both members developed *similar types of schizophrenia* at practically the same age and with the same outcome of the disease. In such pairs no significant differences occur in regard to physical characteristics indicative of constitutional development. As a rule, the strongest resistance to schizophrenic deterioration is found in index cases with high athletic and low asthenic components of physique. The tendency to extreme deterioration corresponds to a high asthenic component, which is inversely related to the athletic component.

The situation is quite different in that relatively small group of monozygotic twin pairs whose behaviour to schizophrenia reveals some significant *dissimilarity*. If one twin remains completely free of schizophrenic symptoms, or breaks down much later than the co-twin, or shows a far more benign type of psychosis, there is always a difference between the twins in regard to physical strength and body weight from early childhood, the difference being consistently in favour of the more resistant twin. Apparently, any factor affecting either

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the general constitutional equilibrium or the stability of body weight has the tendency to reduce resistance to the expressivity of schizophrenic phenomena. For obvious reasons the same agents may be expected to impede the adequacy and permanency of a spontaneously or therapeutically established remission. The list of damaging factors observed most frequently in our monozygotic twin pairs includes unusual physical or emotional strain, pregnancy, acute infections, and a too drastic form of reducing diet. Similar principles prevail in the concordant sets of dizygotic twin pairs.

On the other hand, if all one-egg and two-egg twin partners are compared in regard to similarity or dissimilarity in constitutional characteristics and the clinical course of the disease, the difference between the two twin groups approximates the ratio of 1 : 55. It would be rather difficult to obtain more conclusive evidence for the operation of a graded and, therefore, apparently multifactorially determined constitutional defence mechanism in schizophrenia.

In view of this marked variability in the expression of the schizophrenic genotype it may be concluded that the disorder, although plainly based on a specific predisposition, can be both *prevented and cured*. Therapeutically the most effective procedure would consist in a true duplication of the biological defence reactions of a strong constitution protecting a homozygous carrier of the schizophrenic genotype from developing any or a progressive psychosis. Since it is a clearly established fact that some schizophrenic processes either are arrested spontaneously or remain undeveloped completely, it is equally certain that whatever takes place in the mobilization of the constitutional defence mechanisms of such persons can be identified morphologically and somehow duplicated biochemically. The realization that our understanding of the gene actions of constitutional modifiers is still very incomplete should merely be an incentive to more concentrated attacks on the complex biological problems involved.

In schizophrenia as well as in other inherited disorders the rationale of any treatment depends on the etiology of a disease. If it is evident that the development of a certain type of mental deviation cannot be explained without a specific dysfunction produced by genically controlled elements, a more profound knowledge of these agents is bound to lead to improved methods of treatment rather than to a fatalistic state of therapeutic inactivity. The persistently presumed analogy of inheritance and incurability is merely a reflection of deep-seated general preconceptions and rationalizations which still prevail in relation to the implications of heredity. Unfortunately, even many intelligent and academically trained people have been unable so far to acquire complete immunity from one of the most obdurate taboos of modern civilization.

Generally speaking, there is no inherited disorder which is incurable merely because it is hereditary. With respect to *symptomatic* therapy, the contingencies of inheritability and curability are virtually unrelated, and certainly not exclusive of each other. A depression may clear up spontaneously, or respond to shock treatment regardless of whether it has been predominantly reactive or endogenous in nature. An encephalitic personality deviation acquired in childhood may remain incurable, while a eunuchoid condition will

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lend itself to active hormonal therapy despite its possibly genetic origin. The effect of anticonvulsant drugs is considered independent of the etiologic type of epilepsy treated, and no one will claim that the knowledge of the genetic basis of schizophrenia has interfered either with the discovery of shock treatment or with any aspect of its clinical application. By analogy there is not the slightest genetic reason militating against the development of some new compound that would correct certain biochemical deficiencies in manic-depressive psychosis or amaurotic idiocy.

In fact, as far as the prospects for a *causally directed* treatment of such disorders are concerned, a better understanding of their respective genetic background factors is certain to be of immediate therapeutic value. Since we cannot expect to find a cure for a clearly inherited condition through the simple device of minimizing the effect of heredity in regard to human mental capacities, it is essential to determine how the underlying dysfunction is transmitted, reproduced and brought into play.

In general, one may say that therapeutic action against an inherited disorder is possible either by modifying—perhaps through substitution—the biochemical dysfunction which is the primary effect of the underlying main gene (Beadle), or by changing its expression through methodical stimulation of secondary modifiers and, if possible, through carefully directed management of vital environmental factors. For all of these purposes we have to know, however, how a morbid genotype is chemically constructed, under which conditions it will be able to be fully expressed, and to what extent its expressions may be controlled by constitutional resistance factors.

Apart from animal experiments, the only experimental method available for such investigations is the *twin study method*. At the present state of knowledge, the most urgent need is for the organization of long-range studies of monozygotic twin partners who are still discordant as to the earliest stages of certain types of mental disorder. It should be generally known by now that such twin pairs are of incalculable value for scientific investigation, that their occurrence is rare, and that the failure of any physician to arrange without delay for their thorough examination would represent a rather serious offence of omission. For obvious reasons, the magnitude of the task demands centralization of such twin studies in a few specially equipped institutions. It seems safe to predict, however, that important therapeutic problems of psychiatry will be near their final solution, if it can be determined why some monozygotic co-twins of psychotic twin patients develop no psychosis although they live under comparable environmental conditions; or why they do break down with a milder psychosis at some other time; or why one twin may show a more favourable type of response to the same method of therapeutic stimulation than the other twin. In all future twin studies the emphasis should be on the *cause* of such differences, rather than on establishing the fact itself that significant dissimilarities of constitutional resistance occur in similar genotypes.

It is very likely that there are "easier and quicker opportunities for satisfying the investigator by achievement" (Little). There can be no doubt, however, that properly organized genetic studies will provide the sound foundation of experimental fact upon which psychiatry can surely rely. It is also

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beyond question that man's educability cannot be put to a more vital purpose than to that of discovering the basic truth about the biological phenomena which control his mental health and the emotional stability of future generations.

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MENTAL DEFICIENCY AND SOCIAL MEDICINE.*

By E. O. Lewis, D.Sc., M.R.C.S., L.R.C.P.

This paper is based upon the data obtained in a survey undertaken to ascertain the incidence of mental deficiency in England and Wales. My observations will be restricted to those data that are of most interest to students of social medicine.

For the benefit of those who have not read my Report (1) I will outline briefly the nature of the survey made by my colleagues and myself. We ascertained the number of mental defectives in six areas in England and Wales, each with a population of 100,000 approximately. Two of these areas were urban—one the Extra-Metropolitan Borough of East Ham, the other Blackburn. Two areas were partly urban and partly rural—Exeter with the rural area between the two Devon moors, and Chesterfield with the rural mining area in Derbyshire. The two completely rural areas were the western part of Norfolk, and the two Welsh counties of Merioneth and Cardigan. Over four years were required to do the field work and analyse the data.

The incidence of mental deficiency in England and Wales was found to be about 8 per thousand population. Therefore it is estimated that there are approximately 300,000 mental defectives in this country. This is almost double the estimate given by the Royal Commission which made surveys 25 years earlier. The disparity raises the issue whether the incidence of mental deficiency has increased in this country during the last few generations—an issue that will be recognized as one of great importance to social medicine. Much of the disparity between these two estimates, I am convinced, can be attributed to the fact that my colleagues and I were enabled to make a more thorough and complete ascertainment than the earlier investigators could possibly have done.

Whilst I do not think our data prove conclusively that there has been an increase in the incidence of mental deficiency in England and Wales in the course of the last few decades, I believe they give sound ground for asserting that there has been an increase in certain sections of the population.

One of the most definite results of our survey was the disparity between the incidence in rural and urban areas. The incidence in rural areas was at least 50 per cent. higher than that in urban areas. From whatever angle we examined our data a marked disparity was evident. Of one section of the

* This paper was read at a Joint Meeting of the Psychiatry and Social Medicine Sections of the International Conference of Physicians held in London on September 11, 1947.

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population, that of school-children aged 7 to 14, we can claim that our investigation was almost complete, although not to the extent of that made subsequently by Fraser Roberts (2) of the school-children of Bath.

It is of interest to note in passing that the incidence for lower grade defectives, that is idiots and imbeciles, in rural areas is only 24 per cent. higher than that in urban areas, whereas the incidence for higher grade defectives, the feebleminded children, is 54 per cent. higher.

When attention is first drawn to this marked disparity, it is but natural to challenge its accuracy. Surely, we say, it is easy to confuse rusticity with low intelligence, especially if the investigator be an urbanite imbued with the scholastic bias of a university education. It would lead me away from the main theme of this paper if I were to attempt to deal with such doubts, but I would refer anyone who shares them to Chapter II in my Report on "The Standards and Criteria of Mental Deficiency" that I applied in this survey.

It is not difficult to explain how this disparity in the incidence of mental defect in rural and urban areas has come about. It is associated with the rapid urbanization of England and Wales during the last century. One hundred years ago the rural population of our country was equal to its urban; to-day it is only one-fourth of the urban. During the latter half of the 19th century many a district of our countryside was almost denuded of its best human stock, and was left with a residual population which contained an unduly large proportion of persons of low intelligence. The inbreeding of such a residual population has undoubtedly resulted in an increase in the number of feebleminded children born in these districts. It is significant that what deterioration has occurred in the intellectual calibre of our nation during the last few generations has been due, not to the deleterious environmental conditions of our large industrial towns, but to the selective biological process that has taken place in our rural areas. We should bear in mind, however, that our survey was restricted to the ascertainment of mental defectives, and did not include, as did the surveys of Sjögren and Strömgren, persons suffering from psychoses and neuroses.

Another fact that emerges from our data is the difference in the incidence of mental defect in the various social classes. In order to appreciate the significance of this difference it is necessary to emphasize the distinguishing features of higher and lower mental grade defect. The lower grade comprises idiocy and imbecility, and is of the nature of a pathological or abnormal mental condition. Higher grade deficiency, that is feeblemindedness, is not abnormal, but merely subnormal intelligence or other mental endowment. The distribution of intelligence in the general population corresponds to the normal curve, and the feebleminded are represented in the lowest 1 per cent. of this curve. The feebleminded person differs from the normal person chiefly in that he is endowed with a lower measure of intelligence; the difference is of a quantitative and not of a qualitative nature and there is no clear line of demarcation.

A classification according to social status of the homes of more than 3,000 defectives ascertained in our survey demonstrates a marked contrast in the distribution of lower and higher grade mental defect. Our classification of the

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homes corresponds closely to the five-fold classification generally adopted by the Registrar-General, namely :

Class I : Economically independent class.
Class II : Middle classes.
Class III : Skilled workers.
Class IV : Semi-skilled workers.
Class V : Unskilled workers.

The following table summarizes our classification of the homes. For the sake of simplicity, homes in Classes I and II will be grouped together as " good " homes, those in Class III will be regarded as " average," and those in Classes IV and V as " poor " homes.

Classification of the Homes of Mental Defectives. Percentages.

A. CHILDREN.

Class and grade.	I.	II.	III.	IV.	V.
Feebleminded .	1·2	10·1	27·0	36·5	25·2
Imbeciles . .	5·9	23·7	36·2	19·5	14·7
Idiots . .	9·5	23·0	40·5	21·6	5·4

B. ADULTS.

Feebleminded .	1·9	10·4	34·8	28·5	24·4
Imbeciles . .	6·8	19·9	49·2	17·4	6·8
Idiots . .	8·0	28·0	38·0	16·0	10·0

This table indicates that the lower grade defectives, i. e. imbeciles and idiots, were fairly evenly distributed in good and poor homes. The approximate numbers are—30 per cent. in good, 40 per cent. in average, and 30 per cent. in poor homes. The figures relating to idiots show that the proportion in good homes is definitely higher than that in poor homes— approximately 33 per cent. as compared with 27 per cent. This is probably to be attributed to the better chance of survival the idiot child has in the good home, but possibly this is not the complete explanation.

The distribution of higher grade defectives, i. e. the feebleminded, is very different. Only about 10 per cent. were found in good homes, 30 per cent. in average, and as large a proportion as 60 per cent. were in poor homes. As many as 25 per cent. of all the feebleminded were in the lowest group—Class V homes. It is such a fact as this that makes the feebleminded of primary importance to social medicine.

Although the higher grade defectives outnumber the lower grade in the proportion of three to one, hitherto clinical medicine has paid most attention to the smaller group. Doubtless this is due to the fact that imbeciles and idiots present many conditions of great interest to the neurologist, the biochemist and the endocrinologist. For the student of social medicine, however, the higher grade or feebleminded are of dominant interest because such large

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numbers of them are found in the poorest homes. All the diseases associated with chronic poverty, overcrowding and unhygienic home conditions are very common amongst the feebleminded. The large majority of the home visits my colleagues and I made in the course of our survey were in the slum areas of the towns and to the poorest cottages in the rural areas.

Our visits to the homes made us realize one other feature in which higher and lower grade deficiency contrast greatly. Since some of the factors causing imbecility and idiocy are inherited, we were given occasionally the history that a cousin, uncle or aunt had been known to have a similar condition to the defective ascertained; but seldom did we find more than one idiot or imbecile in the same home. Usually the idiot or imbecile was the only abnormal person in the home; the other members of the family were normal and, not infrequently, of superior intelligence. In contrast to this it was our common experience to find several feebleminded persons in the same home. A child attending school had been found to be feebleminded; on visiting the home we found other children of the family also feebleminded, or very dull, and the parents, if not actually feebleminded, of low intelligence. It is scientifically correct to speak of "feebleminded families." For the purpose of ascertainment I was often confronted with a dilemma of regarding all or none of the members of the family as feebleminded.

We use the term "familial" advisedly, since it does not prejudice the question of aetiology—that is, whether the mental condition is due to inherited or environmental factors. Our survey, being so extensive, was too superficial to give any reliable data on such an important issue. Penrose (3) has made a thorough and comprehensive survey to elucidate the relative importance of these factors. He concludes that 29 per cent. of his cases could be attributed solely to heredity, 9 per cent. solely to environmental factors, but that in 62 per cent. of his cases both inherited and environmental factors played some part in producing the defect.

Investigators who have made surveys of mental defectives soon realize how arbitrary is the distinction between feeblemindedness and dullness. From the scientific standpoint feeblemindedness, as interpreted in this country, is a legal artefact. Blacker (4) has indicated the necessity for a standard nomenclature. Work in the field of mental deficiency is much embarrassed by our vague terminology. The term "oligophrenia," as interpreted on the Continent, is a better term than feeblemindedness because it is applied to all persons whose social failure is primarily due to poor mental endowment. It applies to a much larger group of the community than the term feebleminded. Since, however, we British are somewhat conservative in adopting foreign nomenclature, I intend referring to this larger group as the "mentally inefficient"—admittedly a clumsy and ambiguous term.

As yet we have no reliable estimate what proportion of the population of this country is mentally inefficient. Probably the best index of the number in any community is the incidence of feeblemindedness, because the feebleminded are an integral part of this larger section of the population. There is, however, another way of making an approximate estimate. Educational psychologists have made extensive surveys of the distribution of intelligence amongst school-

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children. These surveys agree in estimating that from 8 to 12 per cent. of the school-children have less than 85 per cent. of normal intelligence. Amongst teachers there is a consensus of opinion that a child with less than 85 per cent. intelligence is incapable of learning the rudiments of education—reading, writing and counting—by the methods of instruction that have proved suitable to normal children. Unfortunately few Local Education Authorities make proper provision for the special instruction of these subnormal children, with the result that they leave school with the handicap of poor intelligence aggravated by neglect during school years. Is it not reasonable to assume that a large proportion of this 8 to 12 per cent. group of children will prove to be socially inefficient when they become adults? The point that needs emphasizing is that these men and women are social failures primarily because they are handicapped with poor mental endowment. It is the numbers in this larger group of the socially and mentally inefficient, and not the feebleminded, who form but a small section, that give rise to many of our chronic social problems, e. g. slumdom, recidivism and child neglect. In a community based upon free competition these people are handicapped from the outset, and as nothing fails like failure, environmental factors such as physical diseases and unemployment increase their handicap in the economic and social struggle.

The men and women who gave evidence before the Royal Commission of 1904 were very hopeful that a Mental Deficiency Act would solve many of our social problems. Amongst those who gave evidence were distinguished men of the medical profession and prominent social leaders. The Mental Deficiency Acts have been in force since 1914, that is for over 30 years. It must be admitted that the hopes of the Royal Commission have not been fulfilled. Why is this?

Let us consider the application of the Mental Deficiency Acts to criminals. Several who gave evidence before the Royal Commission expressed the opinion that a high proportion of criminals were mentally defective. One of the more conservative estimates was that given by Dr. Parker Wilson; he said that 20 per cent. of prisoners admitted to Pentonville Prison showed signs of mental deficiency. Dr. Charles Goring, in his voluminous report on the "English Convict," states that "defective intelligence is one of the primal sources of crime in this country." When we come to examine the number of criminals actually dealt with under the Mental Deficiency Acts what do we find? Norwood East, who for many years was Medical Officer of Prisons in Liverpool and London, and later became Medical Commissioner of Prisons, tells us that only ·42 per cent. of the total number admitted to the Prisons during the ten-year period ending December, 1931, were certified as mentally defective.

We have not far to seek for an explanation. Doctors who have had much experience of giving evidence in Court on the mental condition of criminals find that magistrates and members of the jury usually have their own standard of what constitutes feeblemindedness. Seldom will they recognize an adult with a mental age higher than nine as feebleminded. But large numbers of recidivists who make frequent appearances in Court have mental ages between ten and twelve, and therefore are not brought within the jurisdiction of the Mental Deficiency Acts.

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It is necessary to emphasize that when we speak of the mentally inefficient we have in mind not only the feebleminded, but also large numbers of persons who are outside the scope of the Lunacy and Mental Deficiency Acts. These persons are on the borderline, and have 70 to 80 per cent. intelligence. Our discrimination of the mental capacities of our fellow men is so poor that the majority of persons in this group pass in the crowd as normal, and their record of social failure is attributed to laziness or moral turpitude, or projected on to the broad back of a capitalistic or some other form of economic or social organization.

Without making any claim that this paper contains material that is new, I believe it is fair to say that its main theme, the problem of the mentally inefficient, is one that has received but little attention from psychiatry or social medicine. Further surveys are necessary to elucidate the nature of the problem presented by this section of the community. At present it is impossible to propound any comprehensive solution. The problem raises such far-reaching issues as the relative claims and duties of the State and the individual; and nations have very different attitudes to such issues.

We British are by nature empiricists, not only in our national, but also in international affairs. It is only very recently that the word "planning" has come into our national vocabulary. I am inclined to think that for some time yet we shall attempt to solve the medical and social problems presented by the mentally inefficient by our traditional empirical methods. We shall deal with specific problems as they become urgent. Diseases associated with insanitary home conditions attributable to ignorance and low intelligence, delinquency and high infantile mortality are some of these urgent problems. To be consistently, or rather persistently empirical—because consistency is not expected of the empiricist—in our approach to these problems we should look for individuals who are chiefly responsible for or give rise to them. There is one person who is in a key position, namely, the mentally inefficient mother. Without any wish to appear facetious, I suggest it would be well if some doctor of great experience were to give medical students, soon after they qualify, a talk on the problems the unintelligent mother presents to the general practitioner, the medical officer of health, and the psychiatrist. In passing we may note that such mothers are not altogether absent from the wealthy classes. I feel sure such a talk would do much to prevent the young doctor wasting a great deal of his skill, time and energy. One instance may be cited here—the disheartening experience of the medical officer of health in the eradication of scabies. A school child found to have this condition can usually be cured in a few days; but when this child lives in a home that is filthy, because of the mother's incapability, then the permanent eradication of the disease becomes a difficult problem. Even when medicine has discovered a sure remedy, there is much to be done before the remedy can be effectively applied in the general community.

The newly formed body, known as the Family Service Unit, organizes a voluntary service to assist mothers who find themselves unable to cope with their domestic and family responsibilities. Presumably much of the voluntary work will be done in what is now known as the homes of "Problem Families." This experiment is of great interest, and whether it succeeds or does not, it

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cannot fail to give us valuable information about the mentally inefficient mother.

At a joint meeting of the Sections of Psychiatry and Social Medicine, it is natural to ask the question, "What contribution can the study on mental deficiency make to social medicine?"

After reading some of the text-books and recent contributions on social medicine, the general impression received is that at present its philosophy is essentially that of the environmentalist. This is not surprising. So many diseases and premature deaths are attributable to environmental factors which should and can be eliminated that social medicine focuses its attention, for the present, upon these. There are still many conditions in the homes of the working classes, in factories and mines, that can be much improved.

Statistics show that in recent decades rapid strides have been made in reducing the mortality and morbidity rates of many diseases. The specific feature that interests us at the moment is that with several diseases the rates fell rapidly for several decades in succession, but for several years recently little progress has been made. It is as if a residuum or hard core has been reached that cannot be eliminated by the methods hitherto successful. I suggest that the study of mental deficiency may prove helpful to social medicine when it comes to deal with these residua or hard cores.

To illustrate this, let us consider the statistics of infant mortality in England and Wales. The infant mortality rate, i. e. the number of deaths of infants less than one year of age per thousand live births, was 153 for the decade 1891 to 1900. This rate fell to 100 in the decade 1911 to 1920, and to 72 in 1921 to 1930. In 1939 it was only 50, that is, less than one-third of the rate in 1900. Since 1939, however, the rate has remained much the same; it seems as if we are getting near or have actually reached the hard core of this problem.

At the moment we have in mind more especially the differential infant mortality rates of the various social classes. This is best exemplified by restricting our attention to the mortality rate of children between the age of four weeks and one year. It is amongst children of these ages, and not for still-births or neo-natal cases, that the rates in the five social classes differ most.

The mortality rate amongst these children for the period 1906–1910 was 77 per thousand live births. In 1920 the rate had fallen to 53, and in 1930 it was only 36. By 1939 it had fallen to 22 per thousand live births, but since then there has been little reduction. An analysis of these mortality rates for the five social classes is of special interest. In 1939 the figures were approximately as follows:

Class I (independent)	Rate per 1,000 live births	8
Class II (middle class)	,, ,,	11
Class III (skilled workmen)	,, ,,	19
Class IV (semi-skilled workmen)	,, ,,	24
Class V (unskilled workmen)	,, ,,	30

The infant mortality rate for the poorest social class is about four times that for the best social class. Moreover, statistics show that although the

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general infant mortality rate has been decreasing rapidly during the last 50 years, the disparity between Classes I and V has increased. A reasonable interpretation of this increasing disparity is that the normal and more intelligent mothers have derived immense benefit and have taken full advantage of the medical knowledge disseminated amongst the general public and of the pre-natal and infant clinics that have been established, whereas the mothers of the poorest social grade have not benefited to nearly the same extent. It is to this lowest social grade that the mentally inefficient mothers belong, and their importance in this particular problem is greatly increased by the fact that they are the most fertile group of mothers. Probably some new method of procedure will be necessary before any further substantial reduction can be made in the mortality rate of the children of these mothers.

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SOCIAL SURVEYS.*

By ERIK STRÖMGREN, M.D.,

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I AM very grateful to the Committee of this Conference for giving me the opportunity to say a few words about the aims and methods of social surveys. I must, however, confess that I was somewhat astonished when I got the invitation, because everybody interested in this topic knows that the most eminent experts within this field are English. It would, therefore, seem unnecessary to ask a foreigner to read this paper, and after having heard the lectures of Dr. Lewis and Dr. Blacker I feel still more convinced that I shall not be able to add anything of importance to their excellent presentations.

The Committee have asked me to present some investigations of mine as a basis for a discussion of methods for ascertaining the amount of mental disability in a population and relating it to the social background. This investigation, which was performed some years ago in the Danish island of Bornholm, I should not like to compare with the great surveys of Dr. Lewis and Dr. Blacker, but as it does represent other methods it could be used for a discussion and comparison of methods.

Unfortunately these methodological questions usually seem rather uninteresting to those who have not taken active part in the practical work within this field. On the other hand, I must say that it is quite impossible to estimate the value of the results of a social survey when you don't know exactly which method has been used. Sociologists and clinicians are very much interested in the results of the surveys, but usually rather indifferent as to the methods used. The investigators themselves, on the other hand, often become so absorbed in the methodological questions that in some cases they apparently do not care if they get any results at all. In my report I shall try to strike a balance between these two tendencies.

I hope to be forgiven for making a few historical remarks. Research within our field has been made principally by medical statisticians and by geneticists. The first group are used to estimating the incidence of a disease or an abnormality by counting people dying from it, or coming to hospital for it, or getting some kind of pension for it, but in general they do not try to count people who are staying at home with their disease without trying to get it cured, or to have a pension for it. From some restricted sociological viewpoints these persons may be said to be without the social criteria of the disease, but from a biological viewpoint this is obviously false. It is quite natural then, that geneticists especially, who are interested in revealing every single case of the disease in a given population, have been obliged to find other methods of estimating the incidence of diseases in the general population.

* A paper read at the International Conference of Physicians, London, 11 September, 1947.

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In the early history of human genetics it was thought to be sufficient to study the families of the sick propositi, but soon it became obvious that an exact knowledge of the morbidity in the general population was necessary for the sake of comparison. About fifty years ago the first investigations of this kind were made by Jenny Koller in Switzerland and Jost in Germany, and a few years later they were followed by Otto Diem. Their principles of sampling were not very good, and their results consequently not very reliable. No greater advance in the field took place until in the late twenties Rüdin, Luxenburger and their pupils in Munich became interested in the problem and initiated a series of investigations. Luxenburger was concerned especially with the methodological questions. I think it fair to say that most of his principles were sound enough, but that often they were used in ways which gave quite unreliable results. The most severe objection to these works of the Munich School is that the samples were generally much too small. The confidence in the percentages computed by these authors often depended on not calculating the mean errors. On the other hand, these investigations were of importance in so far as it was possible to join the small samples to larger samples that gave sufficient numerical basis for determinations of the morbidity in the general population.

The principle of these methods is well known ; a number of propositi were chosen, as arbitrarily as possible, and then the incidences of different traits among their relatives were determined ; in all cases the incidences among parents and siblings, in other cases among the children and among the siblings of the parents, too. Afterwards the incidences were compared with the corresponding incidences among the relatives of abnormal propositi. This method of computing the " empirical genetical prognosis " (empirische Erbprognose) has given many valuable practical results. It was soon apparent that in many cases differences in social prognosis were very great. It was obvious, too, that here was a method which made it possible to get an impression of the social importance of many diseases. But still it was rather difficult to compare the results of these sampling methods with the results of the census investigations usually made by sociologists and psychiatrists. A great number of census investigations have been made during the last 25 years. Some of them, especially in Germany and Switzerland, aimed at ascertaining all cases of mental abnormality. Unfortunately the populations that had been chosen were not good samples. The Swiss populations were rather small, and with much inbreeding in them. Both these populations and the Bavarian populations investigated by the Munich School were heavily tainted with goitre and cretinism.

Eighteen years ago the Swiss psychiatrist Brugger made a wide investigation in Thuringia. In an area comprising 38,000 inhabitants he tried to count all cases of mental aberration. He found only 1·3 per cent. such cases—a percentage so small that it is quite obvious that Brugger had not got hold of all the cases he searched for. A few years later Brugger made a similar investigation in a Bavarian area comprising 6,000 inhabitants. This time he tried to investigate all persons living in the area. He found 7·5 per cent. of mental disorders.

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It is quite clear that regarding mental deficiency the investigations of Brugger could not be compared with those of E. O. Lewis, whose material was a hundred times greater and was investigated to a great extent with mental tests. Further, Lewis's samples were probably representative, while Brugger's area was rural and to a great extent afflicted with cretinism.

These investigations of Lewis and Brugger were the most recent models for further studies when in 1931 I began to plan my survey of the island of Bornholm.

I think I must say a few words about the reasons I had for choosing this island for investigation. Bornholm belongs politically to Denmark, but geographically to Sweden. It is situated to the south of Sweden and about 90 miles south-east of Copenhagen. Anthropologically the population is identical with that of Denmark and Southern Sweden. It is quite understandable that the Bornholmians have been to a certain extent isolated from the rest of Denmark, and their language has a definite accent, which is easily distinguishable from all other Danish dialects. The population is very homogeneous and there is no intermarrying of any importance. The island has forty-six thousand inhabitants who know each other fairly well. It is, therefore, always rather easy to get sufficient information about any Bornholmian. If they leave Bornholm you can trace them by their dialect. In many Bornholmian families extensive records of their ancestors and other relatives are kept. No wonder, then, that this island is an excellent object for a geneticist. The island has its own general hospitals, but severe psychiatric cases have to be sent to a mental hospital on Seeland. During the last hundred years the psychotic Bornholmians have always been sent to the same mental hospital.

There could be no doubt, then, that this population must be fine material for a psychiatrist interested in genetics. It would be possible to trace most families through several generations, and it would be easy to determine the morbidity of the Bornholmian general population for comparison. On the other hand, it was not certain that this population was representative of the Danish population as a whole. This, however, turned out to be most probable. In fact, the population of Bornholm in most respects is similar to the average Danish population outside Copenhagen. One half of the inhabitants are living in small towns, the other half in rural districts. The social state is just like that found in other parts of the country. In Denmark few are very rich and few are very poor, and this holds true of Bornholm too.

Diseases seem to be of the same kind and frequency in Bornholm as in Denmark as regards somatic diseases as well as mental diseases. All figures known about these frequencies are on the average Danish level. With regard to the number of persons admitted to psychiatric hospitals, there is the best possible accordance, too. It should be possible, then, to deduce from the findings on Bornholm the state in other non-metropolitan areas in Denmark.

It was of great importance for medical investigations on Bornholm that the attitude of the population towards hygienic measures has for a long time been understanding. Many of the inhabitants have seen that most diseases can be effectively fought on Bornholm because of its isolated geographical state. They have seen that tuberculosis in their cattle has become completely eradi-

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cated, and the same fate now seems to reach human tuberculosis. So it is quite natural for the Bornholmians to take active part in battles against disease.

My personal investigations on Bornholm began in 1933. Before that I had been assistant to the mental hospital to which the Bornholmian psychotics are admitted. At that time I knew already most cases of severe psychoses from that island. In 1934–35 I held a position in the general hospital of the capital of Bornholm, a town called Rønne. In this hospital nearly all psychiatric cases of the island were treated. Coming in touch with a great deal of physically diseased people and their relatives, I had the opportunity of knowing the population fairly well. I came in touch with all doctors and many municipal officers of the island. Furthermore, about 1,000 homes were visited. Having no social worker I had to make all visits personally.

I made six series of investigations. The three first of them aimed at determining the morbidity of the general population, using the propositus method of the Munich School. The three groups had about 150 propositi each. The first group consisted of patients admitted to the general hospital for non-psychiatric reasons. The mental health of these propositi was examined, and so was the health of their siblings and parents. The second and third series of propositi consisted of all persons living in Rønne on a certain date and being 33 or 34 years of age. Their siblings and parents were examined. The reason for selecting the two last-named groups of propositi was a mere practical one; at that time a great tuberculosis investigation was going on on the island, all people between 16 and 35 years being examined. It was very easy, then, to get in touch with these people. For psychiatric purposes the two oldest age groups were the most suitable.

When these three groups were added to each other there were 427 propositi and 1927 siblings. Mental abnormality was found in 12·4 per cent. of the propositi and 5·0 per cent. of the siblings. The first-named incidence must be said to be amazingly high, most of the propositi being rather young. The difference between the incidences among the propositi and among the siblings could only partially be explained by the fact that the propositi had been under the closest personal observation. Another point of importance is that although the first group of propositi, the patients of the general hospital, were not admitted for psychiatric reasons, there might be a positive correlation between admission to general hospitals and mental abnormality.

Of the siblings 2 per cent. were, or had been, psychotic and 0·7 per cent. were feeble-minded. Among the parents of the propositi the incidence of psychoses was higher, and that of mental deficiency lower.

This material was used for a small calculation of the probable effect of eugenic measures towards the incidence of psychosis. Among the siblings of the propositi were found 36 cases of psychoses, but only eight of these had psychotic parents, although there were 27 psychotics in the parental generation. If all psychotics in the older generation had been sterilized, the incidence of insanity in the following generation would have declined from 1·9 per cent. to 1·5 per cent. Unfortunately most of the children had been born before the outbreak of the parental psychosis. Only in one case could one say that

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sterilization had possibly prevented a case of psychosis from appearing in the next generation. This was undoubtedly a rather disappointing result.

As to the incidences found in this material, there was good agreement with other material published up to that time.

The fourth series of investigations comprised a census of a small district of Bornholm, a parish called Rø, containing about 1,000 inhabitants. This district was chosen because it was extraordinarily easy to get good information about every inhabitant. The result was that 12 per cent. of all persons above 20 years were (or had been) mentally abnormal; 2·8 per cent. were psychotics or ex-psychotics and 3·1 per cent. were mentally deficient. This survey was, in fact, a social survey. The social state of all inhabitants was thoroughly investigated. It came out that only in 60 per cent. of the cases of mental disorder had this disorder had any influence on the social state of the patient.

It is a rather difficult thing to compare the results of propositus investigations with those of a census. The differences are obvious. A census only comprises living persons, while a propositus investigation comprises the deceased too. Mentally abnormal persons, especially psychotics, have a greater mortality than the average population, and they will therefore not be adequately represented in a census. If a comparison of the results of the two kinds of investigations must be made, it will be necessary to compensate the excess in mortality of the psychotics. Generally it is impossible to do this, but in a restricted area, where it is possible to ascertain all cases of psychoses which have appeared during the last two generations, the amount of the compensation can be calculated. The demographic conditions in our material allowing such a procedure, a special method was devised. It was applied with the result that it could be said that our census investigation had given almost exactly the same incidences for the endogenous psychoses as had been found in other countries by propositus methods. The excess of mental disorder found in other materials was due to the occurrence of psychoses or defects that are generally not so easy to identify as the great endogenous psychoses.

The fifth investigation consisted in an attempt to identify all persons on Bornholm living on a certain date and suffering from (or having suffered from) psychosis. An attempt was made to ascertain not only persons who had been treated in hospitals, but also persons who had been treated at home or those who had not been treated at all. Among the 46,000 inhabitants of the island were found 525 such persons, that is, 1·14 per cent. Of these, 0·31 per cent. were in hospitals at that date, 0·4 per cent. were still psychotic, but not in hospital, and 0·44 per cent. had recovered from their psychoses.

If conditions were the same in Bornholm as in the rest of Denmark it was to be expected from these figures that in all Denmark 11,500 persons must be in mental hospitals or psychiatric departments of general hospitals. In fact 11,000 persons were found in such places. The agreement seems to be as near as possible. There would, therefore, be good reason to assume that other incidences could be generalized. In Denmark, therefore, there would presumably be about 14,000 psychotics who were not in hospitals and 16,000 persons who had recovered from psychoses. The population of Denmark amounted to 3,600,000 at that time.

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In the sixth investigation we endeavoured to ascertain all cases of psychoses appearing in Bornholm since 1856. It turned out that only the cases beginning after 1890 could be detected with a sufficient degree of certainty. There were 900 such cases, 20–30 per cent. of them being schizophrenics and about 20 per cent. manic-depressives. The relatively great incidence of schizophrenia probably means that in earlier times only the more severe psychoses were always recognized. In the last generations there is a prevalence of psychogenic reactions.

An analysis of the variations of incidence during the 40 years preceding the investigation showed that there had been a rather slow increase of first admissions in this period. During the first 30 years the rate of first admissions for psychoses was about 4 out of 10,000. After 1925 there was a more rapid rise, so that in 1935 the rate was 10 out of 10,000. This rise was predominantly due to admissions to hospitals and clinics other than mental hospitals.

Among the six series of investigations there was, of course, a good deal of overlapping. Most of the propositi appeared in more than one series. This overlapping served as a good basis of control.

As a total result of the different surveys it could be mentioned that about 14,000 persons were registered, 1,700 of these being abnormal mentally.

Since 1938 I have had no opportunity to continue the investigations on Bornholm, but Dr. K. H. Fremming has made a survey there during the last eight years. His method was quite different from those applied by me. He used the so-called Klemperer method, which was first used by Klemperer in 1933. Klemperer chose 1,000 propositi quite arbitrarily from the birth registers of Münich. All his propositi were born between 1880 and 1890. He tried to make a katamnesis of them with special respect to their mental state. No doubt this method theoretically is very adequate, but practically it is rather difficult to handle, because it is not possible to trace all propositi. Klemperer only found 70 per cent. of them, and his results consequently were rather uncertain. It is quite clear that this method could only be used successfuly in a population where individuals are easy to trace. Fremming's propositi were 5,500 persons born in Bornholm in the years 1883–87. He succeeded in ascertaining more than 92 per cent. of the propositi, most of these having passed their 55th year. He got his information from municipal registers,

Dr. Fremming's Investigation (Katamneses of 5,500 Persons Born 1883–1887).

Mental disorders (all kinds)	12 per cent.
Psychoses	4·1 ,,
Schizophrenia	0·9 ,,
Manic-depressive psychosis	1·6 ,,
Epilepsy	0·5 ,,
Inferior intelligence	3·0 ,,
I.Q. below 75	1·3 ,,
Psychopathic constitution	3·1 ,,
Psychoneurosis	2·2 ,,
Criminality	1 7 ,,

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parish registers, the relatives of the propositi, their neighbours, their doctors, and so on. He had to make about 2,000 visits. Fremming made a thorough demographic analysis of his material both in medical and in social respect, and he was especially interested in diseases of social significance. The incidence of psychoses was 4·1 per cent., namely, 3·0 per cent. for males and 5·3 per cent. for females. The risk of schizophrenia was 0·9 per cent., in good accordance with other investigations. The incidence of manic-depressive insanity, however, was much greater than usually found by others. This incidence was 1·6 per cent. to 1·0 per cent. for males and 2·2 per cent. for females. Fremming found many cases which had never been to hospital. Only 15 per cent. of these patients were psychotic on the date of the investigation, and only 3 per cent. were in hospital. I am inclined to believe that this incidence of manic-depressive psychosis found by Fremming could be generalized.

For epilepsy he found a risk of 0·5 per cent. and for reactive psychoses 0·9 per cent. Of the last group 70 per cent. had been mentally abnormal before the onset of the psychosis. 3 per cent. of the propositi were of inferior intellect and 1·3 per cent. were definitely feeble-minded, that is, having an intelligence quotient of less than 75. 3·1 per cent. of the propositi were of a psychopathic constitution. Among the males 3·5 per cent. were alcoholics. Of the drunkards 49 per cent. were mentally abnormal in some other way too; 26 per cent. were psychopaths and 16 per cent. were lawbreakers. 2·2 per cent. of the propositi were suffering from (or had been suffering from) psychoneurosis.

As a general result of his investigation Fremming mentions that 12 per cent. of his propositi had been mentally abnormal, which is in the closest possible agreement with the percentage found by me in the same population, but by means of fundamentally different methods.

In a survey of the social importance of mental disorder Fremming states that among the psychotic and ex-psychotic 38 per cent. were unable to work; among the other abnormals 27 per cent. Of the psychotics 20 per cent. were in hospital or in asylum; of the others only 3·5 per cent.

The incidence of organic nervous disease was 1·8 per cent.

With respect to criminality Fremming found an incidence of 2·8 per cent. among males and 0·6 per cent. among females. 47 per cent. of the criminals were diagnosed as mentally sound; 28 per cent. had a psychopathic constitution; 10 per cent. were of inferior intellect.

In Fremming's material 1·5 per cent. of the deaths were due to suicide. Half of these persons were psychotics, one-fourth were mentally abnormal in some other way, and only one-fourth seemed to have been healthy.

Next I should like to mention a recent survey made by the Danish Social Ministry. The investigation has not been finished, and no results have been published as yet, but the Ministry has allowed me to mention some of them on this occasion. The aim of this survey was an analysis of persons who have got support from the municipality for an unusually long period and not for obvious medical reasons. The propositi were 1,100 persons, who, from April, 1944, to April, 1945, had received poor-law relief for more than 8 months. The propositi were chosen quite arbitrarily from different areas in Denmark, representing all kinds of populations. For every propositus a complete social

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anamnesis was made by municipal officers. Then a social worker gathered more details regarding the anamnesis. All institutions that had been in contact with the propositus were asked to give information about him, schools, employers, colleagues, hospitals, etc. A great majority of the propositi were then examined by two doctors, specialists of general medicine and psychiatry respectively. In many cases other examinations were made, e.g., X-ray, electrocardiogram, ophthalmological, and others.

This material having been collected, each case was made the subject of a discussion by a committee consisting of four or five doctors and two officers of the ministry. In all cases an attempt was made to find the cause of the propositus's failure, and the possible measures to improve his social condition. Not all cases have been finished as yet. The figures given in the following may therefore be somewhat altered later on. As will be seen in the table the morbid

Danish Investigation of Persons Receiving Municipal Support for Long Periods. Causes of Social Failure.

Causes.	Males. %	Females. %
Illness :		
Mental	50	31
Physical	34	28
Alcohol or drug addiction	1	0
Social :		
Divorce	0	17
Husband in prison	0	1
Worn out	1	5
Many children	5	6
Children cannot be taken care of	0	3
No working possibilities in profession	2	0
Wages too low	1	3
Lack of initiative	1	3
Dislike of work	1	1
Previous criminality	2	0
Careless mode of living	1	0
Other causes	1	2

causes of inefficiency were quite dominating. Among males mental disorder was a principal cause in 50 per cent. of cases, among females in 31 per cent. All morbid causes together were responsible for the social failure in 85 per cent. in males, in 59 per cent. in females. Among females the strictly social causes were of a relatively greater importance than among males. The principal difficulties arose for the females in connection with divorce, the wife being unable to get a position of her own at once after divorce. With respect to other causes, there were no significant differences between sexes.

It would be seen from the headings of the " social causes " that some of these in some way or other are connected with specific mental traits of the propositus, these, however, not being of a kind which could be said to be definitely morbid

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I think of the headings "lack of initiative" and "dislike of work." It might become the subject of an interesting discussion whether these conditions could be said to be normal or not.

The rates given in the table comprise the *principal* causes only; in a great deal of further cases pathological causes were contributing to the social failure.

As to the possibilities of work for these propositi the committee arrived at the following conclusions: Of males 14 per cent. had full power to work, 56 per cent. had a reduced power, and 30 per cent. were without working possibilities. For females the rates were 10 per cent., 50 per cent., 40 per cent. respectively.

This material was tainted by the fact that during that period the degree of unemployment in Denmark had dropped to a minimum. It was therefore quite natural that a material consisting of people who could not be employed at a time when employment conditions were optimal must to a great extent comprise extreme minus variants.

In Finland during the last ten years two great social surveys have been made. The results were published by Kaila in the *Acta psychiatrica et neurologica* in 1942. The first survey was performed by the Social Ministry, which wanted to know how many insane and mentally deficient persons were living in the country. Seventy-two boroughs and parishes were chosen arbitrarily as samples. Together they comprised 12 per cent. of the Finnish population. All hospitals and asylums in the areas had to report their patients. The police and the different municipal officers made lists of all persons who they thought were abnormal mentally. By these means about 5,000 persons were reported, and all these persons were examined by psychiatrists. Finally the incidence of psychoses was found to be 0·65 per cent., and that of mental deficiency to be 0·44 per cent. Of course these rates must be regarded as minimum rates, because only such persons were reported who were obviously insufficient.

The second survey was made by the bureau of social insurance. All invalids in the country were asked to announce themselves, and all municipal offices and hospitals, homes, etc., were asked to register all socially insufficient persons. By these means the incidence of psychoses was found to be 0·79 per cent., and that of mental deficiency was found to be 0·44 per cent. The results were thus quite similar to those found in the first investigation. It seems as if the criteria used in the two surveys have been practically the same.

Kaila found that mental deficiency and epilepsy were not equally distributed over the country. He tried to find out which social characteristics these incidences were correlated to, and he stated that the incidences were highest in those areas that had the highest birth-rates, the highest mortalities, the habitations of most inferior quality, the greatest numbers of persons supported by the municipality, and the most extensive emigration. It was quite striking that the feeble-minded were much less inclined to change their habitation than were the average population.

In Norway there has for several years been a very adequate registration of insanity. Ödegaard has made very thorough statistics of admissions to psychiatric departments during a period of ten years. His work was published

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last year in the *Psychiatric Quarterly*. I believe it is one of the most reliable statistical studies of this kind.

It seems as if I prefer the Scandinavian investigations, as I have now for a while talked only about them. I hasten to stress that this is not because I believe them to be of a better quality than other investigations. The reason is that I know this material comparatively well, and that I can estimate to what degree the results are reliable.

It is well known that in America some great psychiatric surveys have been made lately. As an example, I need only mention the investigations of Dayton in Massachusetts. It is not, however, always easy to say what the figures of Dayton really mean. Of course the rates of the total group of psychoses must be rather reliable, but Dayton himself stresses that the delimitation between the diagnostical sub-groups is very uncertain, the diagnostical criteria of the various hospitals being hopelessly different. In some state hospitals 9 per cent. of admittances are schizophrenics, in others 41 per cent., which cannot solely be the fault of the patients.

If I should say a few words about the ways and means of future social surveys I should like to stress that a combination of intensity and extensity of the surveys is essential. The surveys must be so big that we may be allowed to generalize from them, but we must know the structure of the material very closely. The surveys will generally be of such an extent that it will be necessary to have a staff of collaborators, medical and non-medical. It is a good thing, though, if the leader of the investigation takes active part for a period in the routine work, so that he comes to know every link of his future conclusions. Regarding the medical co-workers, I want to stress that field-work of this kind is, according to my opinion, the best way of clinical training which a psychiatrist can have at all. It ought, therefore, not to be difficult to get the best young psychiatrists as helpers in these surveys.

With regard to the registration, it is a good thing to bear in mind that it should be possible to use the material for other purposes in the future. If, for example, a new potent kind of therapy should be invented, it would be of the greatest importance if at once you could see from the material how many persons ought to be treated with this new therapy, how many doctors and hospital beds would be necessary for this purpose, how much money it would cost, and how much it would save. Generally it is quite obvious that it makes a good impression on those who have to find the money for a prospective therapy if you can give them reliable figures as to the amount and the "interest" of the money required.

I am very glad to have heard Dr. Blacker's remarks about the problem of terminology. Of course this is a point of exquisite importance. With some excellent surveys it is true that practically we cannot use them because we don't trust the diagnostical criteria. It is certainly to be hoped that the committee of the World Health Organization will succeed in establishing an international psychiatric terminology. The preliminary list of diagnoses published in April, 1947, seems to be of high quality, and it ought to be possible for all psychiatrists to agree with the main points of it. Of course I must agree with Dr. Blacker that the sub-groups of the psychoneuroses are not

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convincingly differentiated from each other, but if every label were followed by a short description, as Dr. Blacker proposes, and as has been practised in the *Statistical Guide* of the State Hospitals of New York, much misunderstanding could be saved.

Of course you should not force individual psychiatrists to give up completely their own terminology, which each always think to be the best in the world, but you could ask them gently and firmly to use in their publications—or in the tables at least—not only their personal terminology, but also a "translation" into the international terms.

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PSYCHOPATHIC PERSONALITY AS A GENETICAL CONCEPT.*

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IN recent discussions of the subject by Curran and Mallinson (1) and by Kinberg (2), emphasis has very properly been laid on the inextricable confusion that at present prevails in the use of the term " Psychopathic Personality." Very many attempts have been made, for instance by Henderson, Cleckley, Cheney, Levine, Bullard and others (1), to characterize a syndrome. The characteristics of the syndrome have been seen in the make-up of the personality and its social relationships. But every authority disagrees with every other, and if there is any feature in common in all the definitions that have been provided, it is a lasting, but otherwise unspecified, incapacity to build up satisfactory social relationships. The confusion has gone so far that Kinberg has suggested that the term should be dropped altogether, particularly as it promotes a fatalistic attitude in the clinician and does not dispose to enthusiasm in therapy.

This is, I believe, going too far. If we were to drop the term altogether, we should be obliged to invent an equivalent or to hamper ourselves in the description and categorization of a whole series of clinically very important phenomena. If we return to a definition propounded by one of the earlier workers on the subject, Kurt Schneider (3), we will attain a necessary clarity, and be provided with a useful framework for classification. Schneider pointed out that in our use of the words normal and abnormal we tended to confuse meanings of two quite different kinds. Normal could be used either to signify that which was healthy and satisfactory, or to designate phenomena which fell within a certain range of observations of the population at large. Thus according to the first view a mild degree of dental caries is abnormal, according to the second, normal. Schneider goes on to show that the use of " normal " on the first, which is an ideal scale, leaves us at the mercy of changing opinions and of concepts of value which can never be scientifically validated. If we confine " normal " to its second meaning, we have a firm basis of observation on which to rely, and there will be uniformity between workers in the use of the word. Schneider points out that there is a very wide individual range, and that abnormal, i. e. falling beyond this range, means essentially nothing more than unusual. In our experience of life we run into men and women of characters that differ but little from the average of their fellow men, and others who differ widely, who have very well-marked character traits. In some respects variation may occur along lines which have but little medical or social significance, e. g. musical ability, but in other traits there will be medical and social consequences. Schneider proposes using the term " psychopathic personality " to categorize those abnormal or unusual persons who are

* A paper read at the International Conference of Physicians, London, 9 September, 1947.

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from time to time likely to find themselves in the consulting room of the psychiatrist, i. e. those persons who are likely to suffer under their abnormality, or unusualness, and those who are likely to cause society to suffer. From this point of view there is no distinction between these two types except of convenience. At one time a man may be suffering himself under the consequences of a strongly marked temperamental trait, and consequently showing himself as ill and a patient; at another he may be causing society to suffer, and thereby coming into conflict with his fellow men, perhaps to be regarded as, say, a criminal.

It is to be noted that these two forms of behaviour have been embodied in Anglo-Saxon psychiatry as concepts of a radically different kind, and a man of the first kind has been regarded as neurotic, and of the second kind only as psychopathic. This has probably been largely because attention has been diverted from the constitutional aspects and devoted to the mechanisms of illness. The work of Freud and his followers has caused immense emphasis to be laid on the dynamic factors which lead to a neurotic illness, and the whole of the explanation of behaviour of this kind has been seen in these mechanisms. There is, however, now a considerable body of work which suggests some reorientation of our views. The rôle played by psychological experiences in infancy and childhood in predisposing towards an eventual neurotic reaction, and by the proximate causes which eventually precipitate breakdown, remains important; and factors of these kinds must still have a considerable part allotted to them in any adequate consideration of the aetiology of these states. But it has also been shown that hereditary factors play a part in the predisposition, and that all men are not equally alike in their susceptibility to abnormal behaviour.

Furthermore clinical experience suggests that the distinction between psychopathic and neurotic behaviour is artificial. We may take as a prominent example manifestations of a hysterical kind. The type of case which is familiar to all clinicians is that of the woman who is constantly attracting medical attention because of overt symptoms, paralyses, tremors, pains, etc. In this sense she is neurotic. But she also insists on great attention being paid to her illness by other members of the family, interferes in their affairs in an egoistic way, and is indeed causing society to suffer through her abnormalities. In this sense she is psychopathic. We can, I submit, only lead ourselves into confusion if we insist on making qualitative distinctions of this kind, and regard them as of more than momentary and pragmatic validity. The confusion of thought engendered is constantly hampering us in practical day-to-day work. Let us take the case of the epileptic. Because of his fits he is probably receiving medical attention; but he is also very likely to suffer from mood variations often of an explosive kind. These may lead him into conflict with society, and to his treatment, not by medical men, along lines which have no medical justification. But there can be little doubt that the mood changes as well as the fits are the consequences of an altered cerebral metabolism, and equally proper subjects of medical research and treatment.

Earlier workers have adopted the Schneiderian view, but have proceeded from it to a classification of humanity into types, such as the introvert and the extravert. While attempts of these kinds have certainly led to the advance-

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ment of knowledge, they have on the other hand led to an excessive schematization, and the categorization of humanity into water-tight compartments. Modifications of this approach have proved necessary. It is now fairly well established that the greater part of human variation in intelligence is referable to physiological causes, and is controlled by a very great number of genes of small effect. Once we are out of the range of the idiots and imbeciles, the intelligence ratings of the rest of humanity, as has been shown notably by Fraser Roberts, conforms to the normal curve, the hump-backed curve, with its smooth peak at the mean or average, about which the greater part of the population are concentrated. There is every reason to suppose that in respect of temperamental traits, too, the same distribution holds. I would like to refer particularly to the work of Eysenck (4). Taking such a quality as suggestibility, which has frequently been connected by psychiatrists with hypnosis and hysteria, he found that when tests of this function were regarded in a naïve way, it did seem that human beings could be classified into two types, those who were and those who were not suggestible. More careful work brought out, however, that when the tests were sufficiently sensitive about the middle of the range and were not all too closely connected with an all-or-none reaction, the normal curve did indeed hold. He and I would agree in following the lead of Guilford in taking the concept of dimensions of the mind as that which is best adapted to a consideration of observational data, and not that of types.

Human beings must be held to vary, in a way which is adequately described by the normal curve, along not one but very many independent dimensions. Some of these factors which have been analysed by Eysenck and his co-workers are the general tendency to neuroticism, the disposition towards the opposite poles of an affective or a hysterical reaction, body type and body size, levels of aspiration, suggestibility, and others. And these traits, though independent, have correlations one with another. Many of them are shown to have close connections with the disposition to react to environmental stresses with neurotic symptoms. In fact differences between individuals are of a quantitative and measurable kind, and certain traits of personality are particularly associated with neurotic symptoms of one kind, others with symptoms of another kind.

We now come to a consideration of the aetiology, and here I wish to lay emphasis on the fact that I am not discussing the proximate causes of neurotic breakdown or of psychopathic reactions. These causes lie in the strains and stresses of life as we live it, and will differ for each of us. Things which to some are a strain will be a source of satisfaction and well-being to others. Their mode of operation has been extensively investigated by psychoanalysts, followers of the school of Pavlov, by neurologists, physiologists, electroencephalographers, general physicians and many others. What I am proposing to discuss is the predisposing causes of abnormal reactions—those factors which go to the building up of the individual constitution. Here once again I think we are led to draw a lesson from what is known of the causes of human variation in intelligence and mental defect. Intelligence and mental defect are obviously very closely connected with the organization of the brain, and it

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is in the organization of the brain that we must seek one of the principal factors in the determination of individual traits of personality, temperament and character.

Over by far the greater part of the range, once the level of the idiot and imbecile has been left behind, variation in human intelligence is preponderantly controlled by multitudinous genes of small effect; but within the range of the idiot and imbecile other causes are prominent, and these are causes of a type which we are wont to consider pathological. There are, for instance, the single genes of large effect, of which one of the most typical is the recessive gene of phenylpyruvic amentia. If the individual possesses but one of these genes, his intelligence is not more likely to differ from that of the average than is that of any randomly chosen member of the community. If, however, he possesses a pair of these genes, it is extremely improbable that his intelligence quotient will be above 60 per cent. As analogies of these conditions we may note the occurrence of the endogenous psychoses, which have been shown to have a genetical basis, and one which probably depends on a single gene. Apart from psychotic illness, a part of the total variance in temperamental traits may be accounted for in this way. Among the near relatives of schizophrenics, psychopathic individuals have been repeatedly found who show in common certain traits of personality—those we are accustomed to call schizoid. It is not necessary to detail them, or to point out that they have not yet been sufficiently described. The picture is, of course, confused by the appearance of psychopaths of heterogeneous types, present only because of the expected incidence of abnormal personalities caused by normal human variation. The psychopaths found in excess in schizophrenic families are, however, of a very different type from the psychopaths likely to be found among the families of manic-depressives, where we see instead chronically hypomanic individuals, sufferers from a lifelong neurasthenia and mild depression, persons who swing between these poles and are never able to maintain for long an affective equipoise. In the same way we find among the relatives of epileptics, persons who, though themselves never subject to overt motor manifestations, show tendencies to mood variations of a more explosive kind, to impulsive activities, and other traits commonly seen among epileptics themselves. The psychopathies which are related to the endogenous psychoses may therefore, like the psychoses themselves, be the results of single genes.

Prominent among the cases of severe mental defect, we may find not only the effects of single genes, but also the effects of gross environmental disturbance, of birth injuries, infections of the brain and meninges, diseases of unknown but environmental aetiology such as Little's disease. These, too, have their analogues in the temperamental field. Disregarding the frank psychoses, such as general paralysis, we see profound changes in the temperamental constitution and the personality wrought by brain trauma, the so-called post-traumatic personality, known for its tendency to headaches and hypochondriasis, to neurasthenic reactions, to an explosivity of temper. The changes in personality caused by deliberate and localized destruction of brain tissue, such as prefrontal leucotomy, are well known, though still in need of much further investigation. Resemblances exist between these abnormal

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traits of known organic pathology and those which arise endogenously ; manifestations of a hysterical kind are particularly well known in frontal syndromes.

It would I think be superfluous here to go into or even to mention all the possible causes of temperamental abnormalities along known organic lines. Some of them, such as alterations in the balance of the endocrine glands, are clearly of great importance but still very obscure in aetiology and mechanism. Despite the efforts of psychoanalysts and psychiatrists of psychodynamic leanings, the effects of psychological causes also remain far from well defined. It is indeed extremely difficult to disentangle them from genetical causes. If a child has a highly abnormal early upbringing, it is probably because his parents have themselves been abnormal personalities ; and in this case abnormality may have evolved in the child along either of the two paths, environmental or genetical. Methods of research exist, such as the investigation of foster-children, which could help in the disentangling, but they have serious difficulties of their own. Nevertheless we may see the effect of environmental causes of a psychological kind in influencing the development of personality at times in fairly pure culture in the clinical field. Observations of this kind were common among the traumatic neuroses of the war. After some traumatic experience the man might be left still, as far as he was aware, well enough, but with a heightened susceptibility to stimuli of a number of kinds. After a period of worry he might suffer the recurrence of nightmares ; his temper might take on an aggressive or explosive quality previously lacking ; with minor physical ailments there would be a more pronounced tendency to hypochondriasis, etc. The constitution, used in any practical sense of the term, was altered for the worse, although this alteration might itself prove to be of a temporary character.

Observations like this underline the undesirability of viewing the constitution in too static a way. There is no point in distinguishing too narrowly between, for instance, the genetical make-up and factors of an environmental kind. Genetical effects are changing constantly throughout life as genes hitherto latent begin to make their effects felt ; often they will need some specific environmental cause to be brought into the foreground. There is, for instance, a genetical basis for the tendency to delirious and confusional reactions, but it can only show itself when the particular environmental constellation of circumstances is present. The environment, too, throughout life is constantly moulding the personality and its dispositions to particular forms of reaction. At any one time we can only usefully consider what is the constitution at that time, and not what its theoretical components might be.

But when all is said, the single causes of profound modifications of the constitution and personality are unable to account for the greater part of human variation in the temperamental field. For this, as with intelligence, I believe we must go to the genes of small effect, to the total genetical make-up as the principal known source of a sufficient degree of variation. This is not only on *a priori* grounds, although I think it would be very difficult to imagine that factors of the same kind as are known to produce profound effects in most other branches of physiology, in stature and in intellect, could be completely ruled out when we came to the emotional field. We have a considerable body

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of direct evidence that the total genetic make-up is of great significance for personality. This evidence is of course derived from familial relationships, and related to two aspects, which we may call those of specificity and non-specificity. On the first aspect we have striking evidence from the study of uni-ovular twins. The work of Lange, Kranz and Stumpfl on criminal twins has shown very clearly that the basic framework of the personality exhibits a very high level of similarity in uniovular twins, although the twins in their social relations may show superficial differences. The alteration of views that occurred with time is of interest here. Lange was inclined to think that heredity alone could account for criminal behaviour, and he spoke of "crime as destiny." A much less rigid view was reached by Kranz. Careful inquiry showed the significance of environmental and psychological factors, like family traditions, in determining such overt reactions as criminality. But even where there were differences in social behaviour, these were manifestations of similar personalities reacting differently to different environments; the personalities themselves were very much the same in all traits to which a psychiatrist could give a name. So it seems that the contribution made by heredity to the development of character is very important; but evidence from twins tells us nothing about the nature of the genetical equipment involved, and whether it is dependent on one or many genes.

However, evidence of a different kind shows that we are not here concerned with the operation of single genes of large effect. It has so far proved impossible to discover discriminant factors which will separate cleanly from one another the hysterical and the non-hysterical, the anxious and the phlegmatic, the obsessional and the unobsessional. Wherever we approach the issue we find normal distributions and differences in degree. Furthermore there is the factor of non-specificity. When the relatives of neurotics or psychopaths of any particular kind are investigated, we find not only an excess of personalities with abnormal reactions of an exactly similar kind, but also an excess of those showing abnormal reactions of different, although to some degree related kinds. The work of Brown (5) in this field is particularly striking. I believe the evidence is already strong enough to allow us, while accepting the importance of heredity, to reject the single gene hypothesis and to adopt that of multi-factorial inheritance.

It is now too late to consider in detail the consequences of this view. It leads us, I believe, to a more comprehensive and more balanced view of the problems of neurosis and psychopathy than we have at present. Above all, it does not lead us to a static view of the personality, where all is regarded as rigidly set and beyond the possibility of exterior modification. As far as treatment is concerned, while a realistic caution is imposed, fields already found promising of therapy along both physical and psychological lines are left open to exploration.

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THE MODERN APPROACH TO JUVENILE DELINQUENCY: OBSERVATION CENTRES.*

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I. THE JUVENILE COURT AND THE PSYCHIATRIST.

Once it has been established that a child has, in fact, committed the offence with which he has been charged, the interest of a present-day juvenile court is centred not so much on the nature of the offence itself as on the nature of the child and of the influences which may have contributed to the unconventional or antisocial attitude of which his offence may be the outward and visible sign.

This interest in the natural history of the offence and of the offender is the result of a change of outlook toward the social problem of juvenile delinquency which has been taking place gradually in this country since the end of the last century. Children under 14 are no longer sent to adult gaols, and young persons under 17 only in exceptional circumstances. By stages, of which the Children's Act of 1908 and the Children and Young Persons Act of 1933 are the important milestones (1), the attitude of the law towards young offenders has undergone radical change.

The courts now recognize that there is a process of development by which the child attains an adult sense of responsibility, and that this process may be far from uniform in different children as judged by its effects on their behaviour, while yet ending in a satisfactory attitude to society. While punishment has to remain among the means of dealing with an offender, the more enlightened courts now regard it as a poor substitute for removal of the causes of his social inadequacy. In establishing the method of remanding children pending an investigation of their circumstances once the facts have been ascertained, the courts have adopted a procedure which allows of a scientific approach to the problem. It is not surprising, therefore, that they have turned, in investigating the mental attitudes and the behaviour of the children who come before them, to those whose aim it is to apply the methods of science to problems of mind and of human behaviour in general.

Long before juvenile courts achieved legal recognition in this country, magistrates were well aware from their daily experience that juvenile delinquency was associated with poverty and neglect, with bad example or the lack of any example at all, with broken homes and lack of outlet for normal childhood energy. While many of these factors could only be dealt with by major social reforms, it was realized that their effects could be to some extent neutralized if better influences were brought to bear soon enough. Some

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children, on the other hand, on account of mental defect or disturbance or of physical ill-health or deformity, were more prone to get into trouble even when living in reasonably good circumstances. Those who were responsible for the Children's Charter of 1908 realized, in fact, the need for a systematic examination of the problem, for a scientific as well as a purely legal approach.

The response to this appeal for scientific method was seen in the series of surveys carried out in this country and in the United States, where juvenile courts are a considerably older institution. In the period up to 1930 surveys of this kind demonstrated that the technical worker could assist the magistrate in a number of ways. Those of Healy and Bronner in Boston (2) and of Burt in London (3) were outstanding in this respect, while the work of Goddard (4) demonstrated the importance of intellectual retardation as a factor in delinquency. By 1925 magistrates were beginning to accept the fact that a very large proportion of the children who came before them were constitutionally within normal limits, and that with relatively simple adjustment of their environment they could be expected to improve their attitude toward society. The writings of Clarke Hall (5), based on his experience at the Shoreditch Juvenile Court, had a great influence in bringing to this point of view magistrates who had previously viewed with suspicion any movement toward leniency in dealing with criminal tendencies in the young. It had by now been shown that in almost all cases a painstaking investigation would reveal circumstances which had favoured a delinquent attitude in the child. The offence might be the resultant of a variety of interacting factors. Ascertainment of those factors might point the way to treatment, and give the court the guidance they needed.

The next stage in the evolution of the present attitude of the courts arose out of the increasing interest in psychopathology which came with growth of the psycho-analytic schools and the application of the theory of the unconscious to other fields of human behaviour than the psychoneuroses. Attempts were made to apply psychopathological theory to the delinquent child, and to discover the intermediate mechanisms by which an unfavourable environment might produce antisocial conduct. Although at first there was a tendency to strain the facts of experience into a psychoanalytic mould and to underestimate the more obvious environmental factors, it was possible to demonstrate that delinquency was not uncommonly a symptom or a result of emotional disturbance, and that in certain cases psychotherapeutic methods might make a contribution to treatment.

This work was of great importance because it presented the delinquent objectively as an individual who, for reasons of nature or nurture, was unable to adapt himself to life in an organized society. The psychometric workers had already shown that there was a group of children whose constitutional handicap was so great that they had little chance of improving unless provision was made for their education in special schools or for their care in institutions, and that the presence of these children hindered the progress of others in the courts, on probation and in the approved schools.

The magistrates had thus to recognize that each case might set a difficult and involved problem, and that exceptions were likely to be encountered to

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any rules which they might make for themselves for the handling of even clearly definable types of case. It is not to be wondered at that those among them who were unable or unwilling to make the mental effort of understanding the human motives of the children brought before them, were only too glad to pass on the problem to anyone who claimed to be able to understand and to cure. The distrust with which psychiatrists are still regarded by some justices at the present time is to some extent the legacy of those who promised too much but showed so little contact with reality when asked to help the courts. That some magistrates transferred their faith to other systems is not surprising.

The more progressive magistrates, however, faced the fact that detailed investigation was necessary in a considerable proportion of cases, and in the Act of 1933 secured a framework in which it could be carried out. They realized the need for technical assistance. Many of them also saw that such assistance must have limitations until there was both an increase in knowledge and an adequate supply of psychiatrists and psychologists with experience and training in working with the juvenile courts. In a number of areas magistrate and psychiatrist have now worked together for some years, each gaining a knowledge of the other's province and his limitations. From such co-operation has emerged the present feeling that the system of investigation of delinquents can still be improved, firstly in order to inquire into the causes of the behaviour of each child at the earliest possible period in his life-history, and secondly to further the scientific investigation of the problem as a whole, so that techniques can be improved by constant criticism. The need for further evolution on these lines was emphasized by Lord Caldecote, Lord Chief Justice, who in 1942, referring to juvenile courts, wrote that "given the proper organization, it can hardly be doubted that the Act of 1933 can be made a much more effective instrument . . . than has so far been found possible" (6).

Since 1933 very great strides have been made in the organization of juvenile courts, and the co-ordination of the agencies which can contribute to their investigations and carry out their recommendations. Magistrates who have specialized in this work for many years and who have pooled their experiences are seeking constantly to improve their organization and technique, and their efforts have had the effect of gradually raising standards throughout the country.

The co-operation of magistrate and psychiatrist which now prevails in a number of areas was not developed without friction. The wide variation in practice between courts, as shown by the proportion of cases birched, fined, sent to approved schools, put on probation or discharged, was and to some extent still is an indication that there is as yet no sure and established treatment, and that those with bigoted views on the value of this or that system can apply their principles unchecked by the salutary disclosures which result from follow-up investigation. If psychiatrists have found much to criticize in this state of affairs, the attitude of those in their ranks who approached the work with the equally bigoted assumption that psychopathological theory based on work in entirely different fields of psychiatry could be applied unmodified to the

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delinquent child caused an equal discontent in the magistrates. Furthermore, in his contacts with the courts the psychiatrist, and especially the psychiatrist whose main background is in psychotherapy, has had to modify his fundamental attitude to his patient. In the earlier days of psychiatric examinations for the courts there was a tendency for psychiatrists always to report on their patients as if they had been called upon to give evidence for the defence, and to explain away what the child had done in an unfamiliar terminology. They were regarding the child as their patient, and had not adjusted themselves to their new role of providing objective evidence for the court's use, having regard not only to the needs of the patient, but of society as well. A similar state of affairs was seen in the army during the war, when a number of psychotherapists became army psychiatrists. Until they had re-oriented themselves and realized that their efforts were in the interests of the war effort as a whole, as well as of the individuals they were called upon to examine, psychiatry tended to be regarded as a new way of evading justice at courts-martial, or a new route through which men could get out of combatant duties or out of the service altogether. When later the army psychiatrist became the expert adviser to the court-martial, rather than the prisoner's friend, he had acquired an attitude comparable to that needed in advising a juvenile court. When they come to work with juvenile courts, as one hopes they will, these men will already have acquired this most necessary quality of objectivity, and the respect for the rules of evidence which goes with it. If he is to earn the respect of the courts, the psychiatrist must have a realistic conception of the circumstances to which the child is trying to adapt itself. He must acquire a knowledge of the background of his cases, and of the type of environment in which delinquency flourishes. He must see the problem as a social as well as an individual one.

In spite of the initial misunderstandings due to these and other causes, magistrate and psychiatrist have now in many areas profited by their own and each other's mistakes and, with a full realization that there is yet much to learn, have evolved a combination of British justice, scientific method and common sense with a leavening of sentiment which has allowed them not only to understand their cases better, but to pave the way for a better understanding of the problem as a whole.

The view has been expressed by a number of very experienced magistrates (7) that a psychiatric examination should be carried out on every child once his offence has been proved. At many courts in the United States every child is so examined even before this stage. This would not be possible at the moment in this country owing to the lack of psychiatrists with sufficient training. It is possible, however, that some sort of screening examination of every case placed on remand may provide a solution to this problem.

It is well to remember that the relationship between the psychiatrist and the court in this country differs from that in many other countries, notably the Scandinavian countries and the U.S.A. (8). In the former the court does not exist as a tribunal at which the child must be tried, and it is not necessary to establish guilt if it can be shown that there are other circumstances which make it advisable for the court to direct that social measures or special training

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shall be carried out. In Norway and Sweden the court is entirely replaced by a council, resembling a child guidance conference, on which are represented all the agencies concerned with the child (9). In the United States the juvenile court is not a criminal but a chancery court where the State may, if it is considered necessary, assume the duties of a parent when no one else is able or willing adequately to do so.

In this country, where the tradition of impartiality and fair trial is so strong, the psychiatrist stands in relation of adviser to the court. In a certain proportion of the cases he is able to examine the evidence in the light of his experience, and in his report confidently to recommend some course of action. If he is a man of experience in this work and is known to the Court his recommendations are almost invariably acted upon. He may feel that in effect he is deciding the disposal of the child, and may wonder if the complicated machinery of the court could be replaced by an organization more like his own clinic. This is particularly the case when, in the relatively rare instances where the psychiatrist has greater experience than the magistrate, his recommendations are upset because the latter holds views about children which have not yet been tempered by experience. The adaptation of the system of trial to the needs of the child should be assured by the provision in the Lord Chancellor's Rules, in which it is laid down that juvenile court magistrates must be specifically qualified to deal with juvenile cases, but it is now essential that the number of such specially qualified magistrates should be increased. The problem of training adequate numbers of either magistrates or psychiatrists has not yet been solved.

The child is a young citizen, and has the right to expect the same fair trial as is given to his elders. He has the right to refuse special examinations until they are prescribed for him after the charge has been proved. The system as practised at present is scrupulously fair. When one attends some of the juvenile courts, however, and sees the very large number of officials and the multitude of people involved, one wonders whether a little of the expenditure devoted to the dignity of the Court might not be sacrificed in the interests of fuller investigation of the child.

II. The Background of Delinquency and the Psychiatrist's Contribution.

Although it is not possible here to discuss in full the factors of which the interplay may determine delinquent behaviour, it is necessary to review the principal causes in order to show where the psychiatrist can contribute to the investigation and treatment of any given case.

Just as a child under investigation must be considered as a unit of humanity with its constitutional assets and liabilities, trends and vulnerabilities in process of being moulded by the environment it encounters, so it is expedient to consider the factors making for delinquency as divisible into constitutional and acquired, bearing in mind always that in no case are all the factors unfavourable to social adaptation either one or the other.

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TABLE I.

Constitutional.

1. *Mental defect:* Inability to acquire knowledge at the normal rate leading to compensatory mechanisms and inability to adapt as an average member of society.
2. *Psychopathic inferiority:* Inability to keep in step with the group, or to feel or make judgments like an average member of society.
3. *Moral defect:* Inability to acquire any outlook beyond an egocentric one —frequently combined with distorted emotional and hedonic impulse.
4. *Psychosis:* Functional or organic distortion of mental processes, with secondary alterations in attitude to other individuals and to society in general.
5. *Disorder of central nervous system:* Including those predisposing to social inadequacy, episodic impulsiveness, character change and neurotic mental mechanisms.
6. *Physical inferiority:* Disorders of sensation and locomotion preventing normal communication with the group. Metabolic and glandular disorders affecting psychological attitude. Deformities and inferiorities necessitating compensatory psychological mechanisms.

Environmental.

1. Lack of proper nutrition and care, education and example.
2. Deprivation of normal emotional ties.
3. Lack of outlet for ambition, interests and energies. Effects of frequent change of environment.
4. Psychological consequences of constitutional differences from the average.
5. Delinquency as a manifestation of psychoneurosis of whatever causation.
6. Uncertainty as to future, especially of emotional relationships.
7. Positive influences, such as cruelty, or tuition in crime.
8. Effects of misunderstanding of previous delinquency.

Where constitutional factors heavily outweigh the effect of circumstances, little can be done to alter the underlying defect, and the object must then be to ascertain its presence and to manipulate the child's environment so that he can do a minimum of harm to himself and to others. He must be afforded the optimum chance of becoming as contented and productive as his handicaps allow.

It is now many years since the relationship of mental retardation and defect to delinquency was first recognized, and court officials are always on the look-out for members of this numerically important group. If an adequate examination is carried out they can always be detected, though to advise on the subsequent management of some types may require much knowledge and experience. Many backward children are found to be so for the first time as the result of being brought before a juvenile court. The efficiency with which they are detected at present varies, and there is no doubt that in some areas not only are they recognized for what they are only after several appearances in court, but that children and young persons are sent to approved schools who are eligible for certification under the Mental Deficiency Acts (10, 11).

The need for expert assistance in this field is now recognized by all courts, but the fact that the actual testing can be carried out by a psychologist or a trained lay person has led to the belief among some court and local authority officials that the Intelligence Quotient so obtained is a sufficient guide to the

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disposal of a case without the further opinion of a psychiatrist. This is a dangerous belief, especially where it leads to amateur efforts at testing or to the placing of excessive reliance upon group tests. While it is not necessary for a psychiatrist to carry out the tests, the psychiatric examination of the child in the light of the results obtained is essential. Many backward children are stable and their potentialities as good citizens are great, while in others the degree of insufficiency is far greater in the social than in the intellectual field. We have as yet no satisfactory quantitative tests of social adaptability (12), and it must be assessed by the examination of the child in the light of his past history of successes and failures. Only on the result of such an assessment and its relation to his intelligence and temperamental qualities can a sound opinion be given as to placement.

In the field of constitutional psychopathic inferiority, with or without abnormality in the nervous system and in the more serious forms amounting to moral defect, it is likely that the psychiatrist will be able to make an increasing contribution as our knowledge of the subject increases. It is to be recalled that the juvenile court, dealing as it does for the most part with the children of a depressed class, acts as a filter which tends to separate off the inferior members of a constitutionally inferior group where inherited influences have played a large part in placing its members in the unsatisfactory environment which has conduced to their antisocial behaviour. It has long been known, for instance, that minor abnormalities of the central nervous system are more frequent in the children examined in remand homes (13) than in normal school children. In the same way it can only be expected that inherited tendencies to psychopathy of one kind or another will be more frequent, and that a greater proportion may be expected to become psychopathic or prepsychotic personalities when they reach adolescence and maturity. Recognition of such constitutional vulnerabilities is essential to the planning of realistic training and treatment. The ability to assess clinically this part of the child's personality comes only with much experience, but when acquired, it can be of the greatest value to the courts.

The group of moral defectives and of grossly psychopathic personalities is small, but of the greatest importance. Cases of this kind when not recognized for what they are can rarely find a satisfactory place in the administrative framework and are the cause of much embarrassment. They set a bad example in schools and training centres and retard the progress of other children. Since the nature of their disorder is unknown to laymen, differences of opinion as to its causation and correct management frequently arise. These children very often become test cases in minor disputes, and since many of them are of above average intelligence, they are able to take pleasure in fomenting discord. When everything else has been tried, the psychiatrist is often expected to find an answer for problems of this kind. It is extremely difficult to provide for the less severe cases of this sort, and even in the case of moral defectives there is great reluctance on the part of the medical officers of local authorities to co-operate in using the facilities provided by the Mental Deficiency Act unless the child shows a considerable degree of intellectual defect as well.

The presence of severe constitutional defects in a proportion of the cases

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seen need not lead to a fatalistic view of delinquency in general, nor a return to the view that the criminal is born and not made. Indeed such a view could not stand up to the obvious fact that the vast majority of children appearing before the courts eventually make a satisfactory adjustment to life. The follow-up results of all groups, whether first offenders, probationers, pupils at approved schools or trainees at Borstal, show that a minority appear at the courts again. There is a general tendency in the young to conform, which can express itself in spite of the most adverse conditions.

In seeking to give the maximum assistance to the child in his struggle to achieve a normal adaptation, the first and the safest contribution we can make is to remove difficulties from his path which prevent him from having as good an opportunity as other children. The reports of social workers and probation officers contain objective evidence of such factors as cruelty, underfeeding, lack of recreational outlet, poor school attendance, bad companions, poor housing conditions, inadequate sleep, friction between parents, or desertion. It is clear that to remove these adverse factors will do nothing but good, provided that the method of removal does not create problems of its own. Important as this work is, forming as it does the mainstay of the probation officer's approach, its value is limited unless an insight is gained into how these factors are involved in the child's difficulty. This is particularly necessary when empirical social measures do not produce the expected result.

TABLE II.—*Factors Which Can be Influenced by Social Measures.*

Alterable or modifiable.

Unsuitable school or work.
Lack of companions or recreational facilities.
Overcrowding. Neglect and indifference.
Bad companions. Discord with siblings.
Cruelty. Encouragement in crime.
Temptations. Unsuitable recreations in district.
Discord between parents. Overstrictness.
Psychoneurotic parents.

Effects which can be minimized but are not alterable.

Mentally defective, psychotic, drunken, psychopathic or unemployable parents.
Step-relationships. Illegitimacy.
Desertion by or separation of parents.

A more effective approach is to establish the presence of, and to try to eliminate, such factors as a feeling of unwantedness, a sense of inferiority, a resentment of injustice, a desire for revenge, a frustrated ambition, a disturbed sibling relationship, a desire to escape, perplexity as to what is right, a desire to emulate or outdo some other child or a resentment of ridicule. Feelings and impulses such as these may be largely the result of an abnormal social background and may be dealt with by purely social measures. If, however, the intermediate emotional factor is not considered, a drastic social measure, such as removal from home, may do emotional harm while doing material good. It is for this reason that the psychiatrist can by patient and methodical investigation help to provide a basis for the social treatment which is prescribed in the decision of the court.

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In particular, the psychiatrist can, by assembling the available information, see the child as an individual. He is able to realize how numerous are the possible reasons for the child's behaviour, and by what a variety of mental mechanisms the same social conditions may give rise to the same act of delinquency.

TABLE III.—*Possibilities of Disposal of a Child or Young Person Found to Have Committed an Offence.*

Judicial measures:
- Police caution.
- Dismissal.
- Bound over—without recognizances.
- —with recognizances.
- Fined.
- Ordered to make restitution.
- Birched.
- Put on probation—Without condition of residence.
- With condition of residence (hostel, boarding out).
- ,, recommendation as to recreation.
- ,, ,, ,, psychological treatment.
- ,, ,, ,, periodic psychological examination.
- Remanded in custody for further investigation.
- ,, on bail.
- Case adjourned *sine die*.
- Approved school—Short term.
- Classifying.
- Normal.
- Committed to Sessions. Borstal.
- Remanded to prison.
- Committed to care of Local Authority—for residential school.
- for foster home.
- Recommended for—Treatment in hospital.
- Convalescent home.
- Open-air school.
- School for physically handicapped children.
- Attendance at out-patient clinic.
- Certified as mentally defective and recommended for—Hospital.
- Training colony.
- Statutory supervision.
- Certified as morally defective.
- Recommended for farm training school.
- Deemed educationally subnormal and recommended for—
  - Class for educationally subnormal pupils.
  - Special school (resident).
  - Special school (day).
- Deemed maladjusted and recommended for—
  - School for maladjusted pupils.
  - Hostel for maladjusted children.
- Recommended for private hospital or school for treatment.
- ,, ,, epileptic colony.
- ,, ,, Colony for post-encephalitic cases.

From the moment the hand of the law is on his shoulder and throughout his contact with the court and its apparatus, the child is going through a profoundly impressive experience. Many things which are said to him will be remembered, and attitudes taken towards him may have lasting effects. In the course of building up his dossier and of asking him about himself, oppor-

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tunities occur of answering questions, correcting misapprehensions and giving him much-needed reassurance. These opportunities are far more valuable than any which can be created at a psychotherapeutic interview. There is, in fact, a need for psychiatric first-aid in the early stages which may reduce the need for more deliberate psychological repair later. It is very important that the psychiatrist should be at hand not only to give aid himself, but to instruct his team to take such opportunities when they arise.

In a certain number of cases the emotional disturbance within the child may be such that there is little hope of a normal attitude to life without psychotherapy. Except for the first-aid mentioned already and for what might be called psychiatric probation, the number requiring deeper psychotherapy cannot be large. There is a tendency for psychotherapists examining delinquents to underestimate the readiness with which a child responds to a favourable change of circumstances. None the less, such cases occur not infrequently, and it is important that if psychotherapy is required it be commenced at once, in order to profit by the relationship established at the interview. In general, therefore, the contribution of the psychiatrist to the work of a court is to apply scientific method to the assessment of the child's condition and its relation to his behaviour, to inform the court in simple terms of what he has found, and to make any necessary recommendations regarding the amelioration of social conditions and physical or psychological treatment.

III. The Present State of Our Knowledge.

The investigations upon which our present knowledge is based (2, 3, 4, 11, 12) have been carried out, for the most part, on groups of delinquents, and have dealt with such problems as the effect of different kinds of treatment or punishment, the intelligence and physique of delinquents, their family histories, their psychopathology, and the incidence of different forms of delinquency in geographical or social groupings in the community. As a result of this work the general nature of the clinical material has become clear, but the figures available are in the main suggestive rather than conclusive. The time has now come to plan the next steps in this country so that further and more exact knowledge can be acquired.

It must be borne in mind that the effects of the forces which have led to delinquent behaviour in childhood are likely to be felt throughout the individual's life, and the final outcome of the conflict in him between antisocial behaviour and good citizenship can only be known as his subsequent life-history unfolds. Nothing, therefore, short of a very thorough investigation with a detailed follow-up of his subsequent career can tell us whether he has become a useful member of the community, or whether he has merely learned to subvert the social order in some way which does not conflict openly with the law. Only in such a way can we find out what proportion of our juvenile delinquents will later show neurotic breakdown, gross psychopathy, psychosis or recidivism, and how these trends can be recognized and possibly prevented at the earliest moment. Quite apart from the group approach, there is still much to be learned on the clinical side from the study of individual children.

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There are now a number of recognized syndromes in which an established set of causes has brought about an effect, but the number of psychiatrists working on this type of problem has been relatively small in this country, and the work of each only becomes of value when he has acquired experience.

A considerable body of figures has now accumulated from a variety of sources, but it is extraordinarily difficult to draw any but the most obvious conclusions from them. This applies particularly to figures relating to the results of different methods of treatment and disposal. Up to the present attempts to assess results have had to be based very largely on the proportion of cases which do not appear before the courts in a given period of time—say five years—and even five-year follow-up results are not numerous. In normal times, for instance, before the complications of war and evacuation were added, it could be expected that about 70 per cent. of cases bound over or discharged did not get into trouble again within three years (5), 67 per cent. of children and young persons put on probation were not charged again within three years, and over 70 per cent of boys sent to approved schools were not charged again within the same period (16). These figures tell us no more than that about 70 per cent. of cases seen by the juvenile courts are not caught again within three years—whatever is done to them. These results are consonant with the fact that the incidence of offences in general decreases with age. Of every thousand boys aged thirteen, 13·5 are found guilty of offences in the course of a year, by sixteen the figure has dropped to 10, and by nineteen to 6·8 (14). There is thus a tendency, as the individual passes through childhood and adolescence, and finally settles down to middle age, for those whose social maturation has been delayed gradually to conform to the codes of the group. This gratifying fact has led to much confusion in the interpretation of statistics relating to the treatment of juvenile delinquents.

Our objective is to improve the attitude to society of juvenile offenders and to make them into better citizens. We have also to prevent the juvenile offender from developing into the habitual adult criminal. These two objectives are not necessarily identical. Some juvenile offenders are constitutionally incapable of becoming normal citizens, and must be protected, specially trained or segregated if they are to avoid recidivism. The mental defectives, the physically handicapped, the moral defectives are members of this group, as are the grosser psychopathic delinquents. It must be an important part of future research to define as accurately as possible the extent of this group, who show a serious constitutional defect in social adaptation, and to plan for them a life in which they will be able to contribute as much as possible to the community and to do a minimum of harm by their behaviour and their example.

Surveys of adult criminals carried out so far indicate that a relatively small proportion of recidivists show gross evidence of an initial constitutional handicap (18). We are thus able to conclude that the criminal attitude of the majority might have been prevented if circumstances had not irrevocably moulded their attitude to society for the worse. If we are to help them, however, we must first understand the relationship between juvenile and adult criminal behaviour.

Among adult habitual offenders 70 per cent. have made their first appear-

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ance before the courts before the age of twenty (19). This figure has to be considered in the light of the fact that roughly an equal number of offences are committed by individuals of over and of under twenty-one, but it none the less indicates that the recidivists of the future are appearing in the juvenile courts to-day. We are still unable to detect with certainty those in the greatest danger, and the results at our disposal, confused as they are by the fact that most children recover anyway, give us no certain indication as to the best way of detecting them and diverting their energies into better channels.

Of the methods of treatment, that which is best studied and documented is one in which psychiatrists have played no part at all, namely, Borstal training. The reports of the Borstal Association show that over a five-year follow-up the percentage of the group who were doing well after release is in almost direct ratio to their age when first sent for Borstal training, over 80 per cent. of those committed under eighteen proving successful, as against little over 60 per cent. of those committed at the age of twenty (20). The results of approved school training in the lower age-groups show the same tendency (16). This leads us to the expected conclusion that training of this kind is more likely to be successful if it is begun early.

The general impression which emerges is that among the children who appear before the juvenile courts there are three groups which merge into one another. Firstly, a very large group in whom the offence has been merely an incident in the process of acquiring an adult sense of responsibility, who can be expected to recover in any case, and whose recovery may be helped by the adjustment of any environmental stresses which come to light as the result of the court's investigation. Secondly, a group whose delinquency is the symptom of a disturbed attitude to society due to adverse environmental conditions or to gross emotional stress, whose recovery requires active measures, social, educational or psychotherapeutic. The third group are the children with severe constitutional handicaps, and the figures available suggest that those whose handicap is one of inability for social adaptation may form a hard core of potential criminals for whom at present relatively little can be done. In the interests of the much greater number of hopeful cases whom they are able to corrupt, we must face the existence of this group of delinquent psychopaths. The work of Henderson (21) has drawn attention to the importance of this group among adults, and from it we see that the psychopathic tendency has usually been manifest, and therefore presumably recognizable, from early life. Yet there is a tendency on the part of those working with juvenile delinquents to minimize the importance of this group. One of our tasks in the future is to learn to recognize early these cases of poor prognosis and to consider, if they really are doomed to psychopathy, whether special legislation should eventually be provided to prevent them from leading others astray by having them live in communities of their own.

Fortunately it is with the more hopeful cases that we are likely to be more frequently concerned. We have to discover safe means of supplementing the natural tendency to recovery in the same way as a physician does in the absence of specific treatment. In some cases specific social or psychotherapeutic treatment may be possible, but the first principle of all treatment,

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"*prima non nocere*," must be constantly borne in mind. In seeking to do good we must avoid doing harm.

The framework for investigation of the problem already exists if its parts can be linked up. At certain remand homes where psychiatrists have been employed, valuable records have been kept during the past few years, but in other areas such records are of an impersonal character, and are difficult of access in the files of courts, education authorities and probation officers. The records of the future must be planned so that they can have real meaning, and their keeping might be a legitimate function of any centre designed for the investigation and observation of delinquents.

In a number of areas the representatives of the different agencies concerned with delinquent children have, by working together with a common object, formed a team within which the work has been divided up. Such work has usually centred round a remand home. In 1927 the Departmental Committee on the Treatment of Young Offenders (10) recommended the establishment of observation centres, apart from the remand homes, at which children could be studied for a period of time. The Institute for the Scientific Treatment of Delinquency (22) has pressed for closer co-operation between social agencies and the establishment of observation centres and clinics. It might be that the functions of detailed investigation, emergency treatment, contact between agencies, voluntary and otherwise, and the training of personnel could be organized in connection with centres of this kind without seriously disturbing the present structures of the juvenile courts and their work.

A number of different groups have found that they can contribute. The organizers of boys' clubs, for instance, realize that they are able to divert potential delinquents to socially healthier interests. Those who have worked in approved schools have developed their own technique of training and have become confident of its value. The psychotherapist's experience with favourable cases has allowed him to feel that he has a large contribution to make, as has the probation officer and social worker. Magistrates have advocated techniques of their own, such as short-term punitive detention (23), but each group has tended to apply their rule to all or nearly all the cases they have seen. The psychiatrist, if he has a thorough knowledge of the subject and knows the possibilities and limitations of each method, is perhaps in the best position, if he is allowed the time and facilities to investigate each case, to make a *diagnosis*, and to assist the court in deciding which of the available techniques is, in the light of our present knowledge, the most suitable for the child. And if he is to do his work scientifically he must follow up his cases and learn by his mistakes.

IV. Classification and Observation.

The writer has recently had the opportunity of studying the problems of psychiatric examination of juvenile delinquents in an area where considerable progress has already been made in the application of psychological medicine to the problems of the courts. In this area a very experienced group of magistrates are anxious to see the best use made of the many specialists and social workers who might be available to help them.

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The object of this study was to explore the possibilities of modifying methods already in use, and to estimate what personnel would be required to carry out the work to an adequate standard. A temporary team was formed for the intensive examination of the cases passing through the remand homes during that period, and contact was made with all the agencies concerned in order to have their opinion as to possible improvements. Such contacts included magistrates, Home Office and juvenile court officials, psychiatrists, social workers, psychologists, probation officers, police officers, schoolmasters, remand home staff, school medical officers, mental deficiency authorities, the staffs of approved schools, and a variety of voluntary agencies concerned with the care of children. The conclusion was reached that the greater part of the children coming before the juvenile courts can benefit from a planned investigation of their cases, and that any treatment found to be necessary should be carried out at the earliest possible moment. A very large proportion of the cases can benefit from psychiatric survey, and of these a considerable number require observation under resident conditions if a satisfactory assessment is to be made.

If it is not possible, as at present, to investigate every child brought before the court, great reliance has to be placed on the magistrate's judgment in selecting cases for observation. In order to gain an idea of the efficiency of this method of selection, a series of cases referred by magistrates for psychiatric examination was compared (24) with a series of similar size of children remanded but not referred to the psychiatrist. There was little difference between the two groups, and the non-referred group contained a number of cases in need of careful assessment. In view of this finding it would appear that some other method of selection of cases should be employed, or that the magistrates should have the assistance of some sort of screening procedure in deciding which cases to refer. If, for instance, all children who were found by the courts to have committed the offences with which they were charged could be sent for a single day to a centre for group-testing and to eat and play under skilled observation, it might be a valuable addition to the material upon which the magistrate must at present base his judgment. One of the factors which often makes his task more difficult is the inadequacy of reports from schools.

Remand homes as we know them at present have many disadvantages as observation centres. If children remanded on bail are to be examined and if parents and siblings are to be encouraged to come up for interview, it may be necessary to establish special units or centres, unconnected with the remand homes, where the work can be carried out. Such centres would necessarily have a close relationship with the remand homes, and would, in fact, have to accommodate children on remand. It is, however, of the first importance that cases under observation should not come into contact with those awaiting transfer to approved schools, or undergoing punitive detention in the remand home. Novitiates in crime must be protected, at this stage at least, from the sophisticates who have to be held in custody while awaiting disposal. This factor is of particular importance in the case of girls.

The establishment of efficient observation centres is the logical next step in the scientific understanding of juvenile delinquents, and an extension of

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their scope to include follow-up work, teaching and research would provide a framework within which a far higher standard of service could be given to the courts than is at present possible. Observation centres are not a novelty and centres of this kind already exist, particularly in the U.S.A., but they are for the most part due to the efforts of isolated foundations and universities. The establishment of such a centre as part of a local or regional service would mark a considerable advance, owing to the greater ease with which the different social agencies could be co-ordinated. In brief, the functions of such centres, each of which could serve a large area of population, would be as follows:

1. To collect in one place all the available information about the child. Liaison with social agencies concerned in the case. Provision of opportunities to discuss cases. Interviewing parents and contacts both in their homes and at the centre.

2. Medical and psychiatric examinations under conditions allowing of thoroughness. Observation of children under school and play conditions. Psychometric testing, including vocational guidance and temperament testing.

3. Provision of a screening examination on group-test principles for children whose offence has been proved, in order to assist the courts in determining which cases are in need of psychiatric investigation. Examination of children on bail who come up to the clinic.

4. Provision of reports to the courts and to responsible persons in charge of children's training or welfare when placed by the court. Compilation of records. Carrying out of follow-up investigations.

5. Provision of "first-aid" psychological treatment. Arranging for longer term pyschotherapy elsewhere or for placement in hostels for maladjusted children. Assistance to probation officers with their cases. Assistance generally in implementing the court's decisions and recording the results.

6. Carrying out of statutory procedures, such as ascertainment of mental defect and classification of children under the Education Acts.

7. Research into the causation of delinquency from both the individual and social standpoints. Presentation of results of follow-up work to those who decide on treatment. Assessment of results of measures carried out. Study of methods of prevention.

8. Teaching, advice and training of personnel of all kinds who are to work with juvenile delinquents in the region or area supplied by the clinic, including magistrates, psychiatrists, psychologists, social workers, probation officers and the staffs of schools and training centres.

The essential purpose of the centre, therefore, would be to acquire enough information about each child to act as a guide to his treatment in the future. This is exactly what is meant by "classification" as carried out in the new classification schools built or in the course of construction by the Home Office. The great variety of children and young persons committed to approved schools and the wide variation in their needs from the point of view of training has led the Home Office to establish these schools, of which Aycliffe (25) is the pioneer example, where the child's needs can be assessed by allowing him

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to be trained for three months under the observation of an experienced staff. On the basis of their findings he can then be sent to an approved school, which can supply the needs of children in difficulties similar to his own. This system is a great improvement on placement based on such information as may appear in the child's records, or the availability of places at the time he was committed, but one ventures to think that it would never have been necessary if a more intensive effort could have been made to classify the child at a much earlier stage. It has the great disadvantage that, having just had time to settle down to life at the classification school, the child is moved to a new school to start all over again. It is probable that after thorough investigation at an observation centre enough would be known about cases for whom education and training at approved schools was considered necessary to make a definite recommendation as to the type of school at once. Not only is investigation at the earliest possible stage a matter of urgency in many children, lest the opportunity of carrying out effective treatment be lost, but on purely economic grounds it is advisable to carry out the correct treatment at once, and avoid the sequence of unsuitable disposals which too frequently mar the case-records of children who are sent to approved schools.

V. The Observation Centre of the Future.

In the course of my recent investigation it was possible to visualize many ways in which the experimental unit could have done better work had considerations of structure, time, lack of equipment and the need to train personnel not made it impossible during the six-month period. The system already in operation was a creditable attempt to interpret the letter of the Children and Young Persons Act, which had grown, by accretion rather than planning, as the result of intermittent pressure by interested social agencies. As the local authority concerned was a progressive one that had frequently led in the development of this work, the lessons to be learned from it were of great value. From the data and impression gained during the experimental period it is possible to form an idea of how an observation unit might be organized in which an adequate standard of service could economically be given without seriously altering present methods of juvenile court procedure.

An attempt will therefore be made to outline the features of such a unit and its relation to the basic administrative mechanism for the disposal of the juvenile delinquent. A list of the main social agencies interested in such a unit and with whom liaison would have to be established is given in Table IV, while some of the sources from which information about children would have to be obtained is given in Table V. It must be said at the outset that the greatest single difficulty in threading a child through the complicated legal and administrative machinery which provides for its welfare is to obtain adequate liaison between the different agencies and to reconcile their differing points of view. While the present incomplete facilities for children's welfare exist, decision about the disposal of a child may require the reconciliation of departmental interests and efficient compromise between the ideal course of action and what can practically be done. This would be less difficult if those who were con-

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cerned with the child could discuss the matter together with the common object of securing the best for each case; it is extremely difficult when the matter is purely a paper transaction to some of those concerned. It should be possible to provide liaison at the practical level as part of the function of the observation centre.

The functions of the observation centre will be dealt with under the headings of *Location, Size, Structure, Organization, Personnel* and *Economics.*

TABLE IV.—*Agencies Concerned in the Investigation and Disposal of Remanded Children.*

The magistrates, the court and the police.
The Home Office and the probation service.
The Local Authority Public Health Department.
Local Authority Education Department.
Local Authority Social Service or Special Officers.
Additional agencies who might be concerned with an observation centre:
(1) University or other body responsible for training and maintaining standards of—
Psychiatrists.
Teachers at approved schools (26).
Social workers.
Probation officers.
Educational psychologists.
(2) Authority concerned with training magistrates for work in Juvenile Courts.

TABLE V.—*Information Required and Its Sources.*

The offence—its background	The Court.
Police proceedings	Local authority officers.
Previous offences	Probation officer.
Personal history	Parents and contacts.
Family and social history	Social agencies, club officials.
Effect of previous measures.	
Educational history	School reports. / Education authority files.
Behaviour under observation	Staff of remand home or observation centre.
Medical history	School medical officer. / Reports from hospitals and clinics.
Intelligence level	Psychologist.
Special aptitudes and deficiencies	Psychologist.
Vocational suitability	Psychologist.
Temperament	Psychologist.
Physical state and handicaps	Physician.
Psychiatric status	Psychiatrist.
Stability and attitude to circumstances	Reports from clinics.

Location.

As the provision of an observation centre does not eliminate the necessity for a remand home, and as the children will frequently have to be transferred from one to the other, the two should, if possible, not be far apart. The principal disadvantage of housing both in the same or adjacent buildings is, apart from the possibility of communication between the two groups of children, the fact that the stigma of having to come to the remand home might deter

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parents from co-operating with the staff and where necessary bringing up siblings for examination. Owing to the need for visits from parents and social workers, the centre should be in the locality from which delinquents are mainly drawn and should form part of its Mental Health Scheme. It should be within easy reach of hospitals and clinics for special investigations and, if possible, of the court. Nearness to a school might allow of the use of a number of part-time teachers.

Size.

As the incidence of juvenile delinquency varies in different areas and fluctuates in any one area, it is difficult accurately to estimate the number of places required in relation to the population. Cases would for the most part need to stay only two weeks, with a minimum of one week and a maximum of three months, so that the number required is not large. It is thought that provision of 20 places per million of population would be sufficient for larger areas, although this could be greatly reduced if a greater number of children were remanded on bail and given a less complete investigation at a series of visits. It would be uneconomic to run a centre for less than 25 children, and observation would be difficult if the number were over 80. The need to segregate different types of case would lead to wastage of space, and it would not be possible to expect the places always to be filled. It is probable that a centre for 40 children, with an upper age limit of thirteen for residents, with places for 30 boys and 10 girls would be ideal from the point of view of observation.

Such a centre could deal with more children without admitting them, and could undertake the investigation of older boys and girls up to seventeen by arrangement with remand homes. Admission of this older group as inmates would add greatly to the difficulties of segregating elements who could do harm to others under observation.

Structure.

As it is necessary to segregate groups of children at night, a number of small rooms are needed capable of holding from one to three, as well as the dormitories, which in any case should not hold more than ten. Schoolrooms are needed, for older boys and girls separately and for the younger children mixed. Play facilities, both indoor and out, must be sufficient to bring out any tendencies worthy of note as well as providing adequate freedom. There would be no objection to a common dining-room entered from both sides of the building. There should be facilities for handicrafts and toys and materials which can to some extent act as test material in the hands of the teachers. A portion of the building should be unobtrusively escape-proof, although the majority of the children will need little persuasion to keep them in.

It is important that the resident portion should have a separate entrance from the offices and consulting-rooms, which should be arranged as a clinic with its own door opening on to the street. This part would comprise a registry and records room, separate rooms for physician, psychiatrists, social workers

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and psychologists, a playroom for visiting children, a waiting-room and conference room. A changing room for children, with lavatories, and a room in which visiting workers can write notes and interview parents completes the non-resident side of the centre. This side should have the outward appearance of a health centre or child guidance clinic. A most important feature is the provision of enough telephones, as a great deal of work of checking information about children or making contact with voluntary agencies can be carried out by telephone, and casual calling by workers thus reduced to a practicable level.

Organization.

It is clear that the courts who are to make use of the results of observation must be in full communication with the observation centre, and that they should be represented on its committee of management. The other agencies concerned must similarly be represented. Close contact is needed with the local authority and its facilities for child welfare, its hostels and special schools, and the centre itself would be best managed by a local or regional authority. It would not appear now to be necessary for the centre to be pioneered by a voluntary organization in the first place, as the need for something of the kind is clear enough for local authorities, or the central authority in charge of all deprived children (28), to interest themselves from the outset. The committee of management could well act as a co-ordinating committee between the courts and the local authority, such as that recommended in the Vick Report on the London Remand Homes (27).

From the point of view of teaching and research and the maintenance of standards, centres of this kind should be linked with a university where the teaching of psychiatry, applied psychology and social science is undertaken. In exchange for teaching facilities the university might be expected to provide consultant staff, and to attach trainees and research workers who could contribute to the service given by the clinic. There would be no objection to the centre also being used for statutory duties by the local authority, such as the examination of mental defectives and examinations under the Education Acts, provided that these children, using the centre as a child guidance clinic, were not admitted as residents. The treatment of maladjusted children, including delinquents, could not be undertaken at the centre, but would presumably be carried out at the schools and hostels for maladjusted children provided for in the Education Act. In a region where child guidance facilities are at present poorly developed, the observation centre could be planned as part of an integrated scheme for dealing with all psychological deviations in the young. In this the closest collaboration of the school medical service and the education authority would be necessary. The building of an observation centre presupposes a fair degree of development of other child welfare services which can act upon the results of observation.

The most difficult problem, perhaps, is to decide who is to administer such a centre. There is a case for placing it in the hands of a psychiatrist, who, of all the workers concerned, has contact with the greatest number of approaches to the subject. He could not, on the other hand, satisfactorily administer

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the centre as a residential school, and the best solution would probably be to have a lay superintendent for the resident care, with a psychiatrist as director of the clinical work.

Personnel.

While the number of trained workers employed and the amount of time they give will depend on the size of the centre and the number of cases attending for non-resident examination, certain specialities must be represented on the non-resident staff. For the examination of children the psychiatrist, the educational psychologist, the psychiatric social worker and those in charge of records; and for their care, observation and teaching, a superintendent, matron, housekeeper, teachers and handicraft instructors. Much of the collection of information and carrying out of the court's decisions will, as at present, fall to the probation officers and others, and much useful work can be done by trainees in the various specialities, the function of the clinic staff being to advise and co-ordinate. The teaching function of such a centre is of the first importance, as in this way the lack of trained personnel can be made up, and some idea of the aims of this work imparted to those who are engaged in social services whose contacts with juvenile delinquents are only occasional.

In many branches of children's welfare, and especially psychological welfare, workers frequently show strong emotional bias, or adhere to special views or schools of thought which render it difficult for them to approach the subject with real scientific humility. It is probable that the standards set by a university department would do much to maintain a sense of proportion among such enthusiasts, and to get the best out of their keenness to help the child in difficulties.

Economics.

Owing to the necessarily high rate of turnover, the cost of maintenance would probably approach that of a children's hospital, and it would certainly be greater than that of a remand home. When it is remembered, however, how much trouble and expense can be caused by a single child who cannot be fitted into the educational machine, and how much can be saved by finding out the right way to deal with such a child before it has upset and corrupted the others with whom it is placed, it can be seen that the service provided would be worth the expense. If it were designed as part of a general Child Health Service, the cost would not be so great.

VI. The Preventive Aspect.

No physician can work long with juvenile delinquents without being saddened by the thought that the unhealthy attitude to society which many of them exhibit could have been prevented, and that he alone is powerless to prevent potentially healthy children from having to pass their most impressionable years in an atmosphere of squalor and frustration. While he can examine the products of this culture medium and sometimes attempt to transplant them to a more suitable one, he can do little to alter the medium itself

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in which indifferent heredities breed in a milieu of suffocating discontent. The group from which the overwhelming majority of juvenile delinquents come is, like the unemployables and the problem-families, the portal of entry to a great social problem. A study of this depressed section of the community, who are unable for a variety of reasons to achieve the degree of social adaptation necessary for present-day civilized life, is inseparable from the study of delinquency.

Furthermore, juvenile delinquency may be regarded to some extent as a barometer of national and of local morale and cohesion. Delinquency increases with war, when civilization regresses, and it becomes out of hand in conditions such as obtain in Germany to-day, when confidence in the social order is at its lowest, and necessity drives parents to orient their lives only toward the immediate future. In the child it may be a symptom of a troubled mind. In the community, the district or the social group it is the symptom of inability to develop a social sense. In the examination of problems such as these by social survey methods an observation centre for delinquents could make a valuable contribution.

It is not enough to examine the individual delinquent whose conduct has caused him to merit the attention of the juvenile court. If we are to prevent his younger brother from appearing next year we must seek him out now. Even now one sees children who have tried hard to get help—have run away and given themselves up at police stations, have committed offences in the hope of being taken away from their homes. Cases such as this draw our attention forcibly to the hardships suffered by the underprivileged child at home, as have the findings of the Care of Children Committee (28) to the conditions under which the deprived child may have to live. Since the public conscience was first awakened to this problem much has been done, but there is much still to do, and the combination of sympathy with scientific method which the psychiatrist can bring to the problem must surely play an important part.

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THE SIGNIFICANCE OF THE HOME FOR THE CHILD'S EMOTIONAL DEVELOPMENT DURING THE FIRST SIX YEARS.*

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I DO not think that anyone, professional or layman, will contradict the statement that the family unit is, at least in our culture, the best medium for the growing child. Yet, although there is tacit recognition of this fact, it is only in recent years that more attention is being paid to providing for children, who in infancy are left without parents, with this most suitable environment for their development. In this and other countries there are still vast institutions, insufficiently staffed, entrusted with the task of bringing up hundreds of children who, we know, will become unsatisfactory citizens.

One of the reasons why this state of affairs still exists is that until recently no scientific proof has been advanced to disclose the damaging nature of an early upbringing away from the family unit. It may, therefore, seem justifiable to put forward the theories and facts that show that the family unit is the best medium for a satisfactory emotional and character development, as a scientific background to the Curtis Report, which came to this conclusion on the basis of empirical data.

Even at the present stage we are not able to prove this contention, in all its details, by objective scientific methods. There are, in my opinion, two main factors accounting for this difficulty. The damage caused by an upbringing away from the family circle is not immediately open to observation by untrained observers. Toddlers in a good institution may look well fed and well clothed, and may be well behaved. It is only on closer observation and with the knowledge of adult psychopathology in mind that the fact that these children cannot form a good object relationship will become apparent. Miss Fildes drew attention to this recently when she talked to this Section of her experiences during her investigation for the Curtis Report. It is, therefore, only a small number of trained observers who perceive the disturbance, and whose opinion will stand against that of the vast majority of lay people and even professional workers who judge by appearances only.

The second reason is the inherent difficulty of proving these hypotheses. Our knowledge of the damage caused by an unsatisfactory early upbringing was originally not derived from the observation of children, but from the treatment of adult neurotic patients. This enabled us to understand unconscious processes as well as conscious ones. It opened to us hitherto unknown recol-

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lections of our patients' past experiences. The psycho-analytical treatment of adult neurotic patients allowed Freud (3) to reconstruct phases of instinctive and emotional development during the first five years, which were later confirmed by the analytical observation of children. Nowadays it is very easy to find clinical observations confirming some of these hypotheses. The small child's sex curiosity can be openly observed. But, as the hypotheses dealing with mental structure have a dynamic and genetic aspect, it is extremely difficult to formulate propositions open to experimental proof. Many attempts of this kind have been undertaken in the last decade or two, especially in America, but only few of them are really successful. David Levy (5), for instance, tried to measure sibling rivalry in different groups of children. In the experimental situation the behaviour and verbalizations of the experimenter were controlled and the reaction of the children was carefully observed. The data were treated statistically with relation to age, position among siblings, type of reaction and so on. A number of typical reactions were described and certain conclusions were drawn from the experiment. But what the author overlooked is the fact that he is not investigating a single factor—sibling rivalry—but a complexity of factors. The child's reaction in the experimental situation is not due only to his feelings for the younger sibling, but is dependent on the sum total of his emotional development inside the family circle. The strength and nature of the reaction may depend on the child's relationship with adults far more than on the single factor of sibling rivalry. The influence of past experiences is not measurable in that particular experimental situation The same difficulty presents itself in the frustration experiments of Bark Dembo and Lewin (1), who, when they prevent the child from getting the coveted toy, are not able to take into consideration the child's former experiences.

The positive factor in all these, and many more experiments of the same kind, is the attempt to create experimental situations in which single dynamic factors can be observed under controlled conditions, allowing for quantitative estimations. But, so far, the results are not very far-reaching, and only some of them, one of which I shall mention in more detail later on, can help us to prove our contention that family life is the necessary pre-requisite for normal emotional and character development.

It is, of course, not possible to view the whole complexity of the problem in this paper. I shall, therefore, discuss the importance of the family setting in respect to—

(1) The modification of primitive instinctive drives, which allows later social adaptation.

(2) The significance of the first object relationships, on which ego development is dependent.

(3) Super-ego formation, which is the most far-reaching step in gaining moral independence.

These three aspects of personality development are, of course, closely linked up with one another and separation is artificial, but for theoretical purposes I shall have to discuss them one after another.

At this point I should like to mention that the scientific background of my

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ductions is that of the psycho-analytical theory, which I find the best working hypothesis at our present stage of knowledge.

It will be necessary to make a few general statements, the validity of which I shall take for granted for the purposes of this paper. I believe they are more or less accepted if not always expressed in the same language:

(1) The most important period for the formation of later behaviour patterns occurs during the first five to six years of life. This does not mean that very important changes may not still occur later on, but the structure of the personality is already formed at the beginning of the latency period.

(2) The environment during these first years is represented by the actual persons handling the child. Material conditions exert their influence only indirectly, in so far as they may shape the attitude of parents or parent substitutes.

(3) The mental structure and character of a person is the outcome of an interaction between innate forces and forces emanating from the environment. Amongst the innate endowments the instinctive urges are the medium of mental energy.

(*a*) On the Transformation of Primitive Instinctive Drives.

Instinctive urges, libidinal and aggressive ones, pass through certain phases of maturation. According to the erogenous zone we distinguish an oral organization of instinctive urges as being predominant during the first 14–16 months of life, an anal-sadistic organization during the second and part of the third year, and a phallic organization between the third and fifth year of life. It seems important for later mental equilibrium that, hand in-hand with this biological process of maturation, a corresponding emotional development should take place, and this is to a considerable extent dependent on the influences arising from the environment. It is on this point that interaction of constitutional with environmental factors can be shown most clearly. Infants show individual differences of reaction from the first day of life onwards, and the same attitude of the environment will have a very different effect on different types of babies. As far as the instincts are concerned, there seems to be a difference in their strength or quantity. There is also, perhaps, a qualitative difference, which only becomes apparent some time later in so far as one instinctive urge may be more pronounced than others, thereby constituting a different distribution of instinctive energy altogether. In some children anal-sadistic trends are very strong, in others exhibitionistic tendencies seem of outstanding importance, without any encouragement from the environment. Margaret Fries (4) has studied the "congenital activity types" of infants, classifying them into quiet, moderately active and active infants, and draws attention to the fact that these three types of infants approach similar situations in a different way.

For the purposes of this paper I shall neglect these constitutional differences, as I should like to stress generally valid factors of emotional development more than individual varieties.

Many instinctive urges, libidinal and aggressive ones, which make their appearance during this early process of maturation, are by their very nature

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antisocial and have to be transformed. This occurs under the pressure of the environment reacting against these primitive tendencies. As these instinctive drives are representative of mental energy, their modification should proceed with as little loss of driving force as possible. Sublimation, whereby the energy behind the drive is being preserved, and only its aim is being changed, is more satisfactory from the economic point of view than reaction formation, whereby the energy behind the original drive is being used to build up a counter drive of an opposite character. But both these mechanisms are more economic than repression, because there the energy and content of the primitive drive are both being kept away from consciousness and action by a force, which in itself uses up new energy if it is to remain effective. The far-reaching effect of a satisfactory, that is economic transformation, of early antisocial drives has to be seen in its entirety in order to estimate its enormous importance in character development. If we take as an example an aggressive drive, for instance the desire to hurt another child, this can undergo many modifications, leading to very different end-results as far as character development is concerned. To discuss a few of the possibilities :

(1) It may be sublimated. The desire to hurt may be diverted from human beings to animals and then on to toys. The pleasure in destroying toys may slowly be diverted into the pleasure of constructing, and may from there lead to a general interest in technical matters. This is only one possibility of the sublimation of an aggressive drive, but it shows already the instinctive basis of many of our daily activities.

(2) It may be transformed by reaction formation. The energy which was behind the desire to hurt may be used up in order to feel pity for the other child when it suffers and, thereby, prevent further aggressive acts. Pity, or the capacity to pity, is a character trait ; it may also, later on, play an important part in the choice of profession or other ego synthonic achievements.

(3) The aggressive drive may be turned into its opposite. The pleasure the child originally derived from hurting another child may now be derived from the desire to be hurt. This may lead to a masochistic orientation.

(4) The desire to hurt may be repressed altogether. The wish and its driving force sink back into the unconscious. For a time aggressive tendencies may disappear from the child's daily behaviour, and close observation will show that energies have also been withdrawn from the child's other activities. He will become shy, timid, afraid of tackling new objects and so on. This repressed instinct, which is now cut off from further modification, may, in certain circumstances, come to the surface again. The aggression of anti-social children, especially of boys, is very often a second edition of earlier aggressive drives, which have been repressed, and are rising again in their original form as a defence against passive desires.

I have given this rather schematic picture in order to indicate, in a somewhat simplified form, the relationship of a satisfactory transformation of early instinctive drives with character formation. I should like to emphasize that all these, and many more, mechanisms play a role in the psychic structure of every individual ; everybody represses and sublimates. A favourable outcome is a matter of quantity rather than quality—whether, relatively speaking, more

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economic or more uneconomic means of transforming antisocial instinctive drives were used.

This first period of instinct development is important not only from the point of view of character formation, but also because it is during this time that the basis for later neurotic illness may be laid. It has been mentioned that normally instincts run through certain phases of maturation. At any of these phases libidinal as well as aggressive instinctive urges may become arrested, thus establishing a fixation point. This, together with certain inherited inclinations, constitutes the predisposition to neurotic illness.

Under which conditions can the transformation of early instinctive drives proceed most satisfactorily?

This is easily expressed in theory, but in practice it is extremely difficult to achieve. The expression of instinctive urges in any stage of this process of maturation should to a certain extent be admitted and encouraged, and the pressure against these drives should be very slowly administered. There should be neither too much gratification nor too much frustration against any one of these primitive antisocial drives. If the environmental pressure is too strong and too quickly or too early applied, mechanisms like repression will outweigh the more favourable mechanisms of sublimation and reaction formation.

Suppose that at the time when a child is most interested in its excretory functions the mother is equally, though unconsciously, excited by the same functions: she will pay constant attention to the child's excretions, will not allow him to use the lavatory alone, etc. Under these conditions antisocial urges, which should have been slowly modified, will remain in their original form for too long as gratification is constantly forthcoming. Eventually they will have to be repressed instead of, for instance, sublimated. If, on the contrary, training for cleanliness has been effected too soon and too quickly, these instincts will not have found any gratification at the proper time, and the desire for them will remain unchanged, even though repressed, and will hamper further development. At the same time, in both cases, this phase of instinctual development will retain too much libidinal and aggressive energy, and will, therefore, constitute a weak spot in later development, a fixation point to which the libido may at any time regress.

The foregoing exposition of the modification of early instinctive drives may give rise to the idea that it would be advantageous if early education were to proceed in specially adapted institutions under trained personnel, who would apply gratification and frustration in the appropriate dosage at the appropriate time. This might appear a good plan, especially as it seems very unlikely that one can train mothers all over the world in instinct development and its handling. I have mentioned the danger of discussing an isolated factor of character development before.

It has been stated that character development proceeds by an interaction of innate tendencies with forces originating from the environment. So far, the development of these innate tendencies has been described. No consideration has been given to the reasons why the child wishes to satisfy these innate drives, and for what reasons he can abstain from doing so.

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(*b*) Early Object Relationships.

It is, of course, common knowledge that the satisfaction of instinctive drives causes pleasurable sensations. The infant, during the first weeks of life, knows no more than the tension caused by a rising instinctive urge, like hunger, and the pleasure experienced when the drive is adequately satisfied. The infant and small child, certainly before the development of a more consolidated ego, but to a certain extent up to the time of super-ego formation, is dominated by the pleasure principle. It seeks to gain what causes pleasure and to avoid what causes pain, and at this early time the demands of the external world or the pressure of the environment do not directly exert any influence.

The reason why the small child will eventually exchange the pleasure for the reality principle, that is to say will take into account the demands of the external world, apart from his desire to satisfy his instinctive urges at all times and in all places, is his relationship with his mother, which grows into an equally, if not stronger force, than the demands of his instincts.

This relationship, which is primarily built upon the fact that the mother is the first person to satisfy the infant's bodily needs, grows into a strong emotional bond in the second half of the first year. A baby, at the age of about nine months, needs his mother's presence at all times, not only when he is hungry or cold. He follows her around with his eyes; he wants to touch and fondle her, and is extremely unhappy, and often in despair, if his mother leaves him for any length of time. The processes which bring about this strong emotional tie are complicated ones, and are primarily dependent on the fact that the mother offers herself as an object for the satisfaction of instinctive urges. The child can begin to distinguish between the self and the external world whenever one of his instincts is not satisfied, and so learns in time to connect the pleasure of satisfaction with the presence of his mother. This distinction between the self and the external world is the first step in ego development, which, therefore, comes into being in the relationship with the mother, and the progress of which is dependent on the course this relationship takes.

The disastrous results of separation from the mother at this early age and institutional care in her stead are one of the few points which have been corroborated by objective scientific methods.

R. Spitz (6) undertook a controlled experiment with a view to examining the influence of the mother's presence on the child's development during the first year of life. The objects of his investigation were babies living in two residential nurseries—Foundlingshome, in which infants had no relation to adults except for feeding times, and Nursery, in which the mothers themselves were entrusted with the care of the babies. To assess development he used the Hetzer-Wolff baby tests. He found that, although the developmental quotient for the babies in Foundlingshome was higher at birth than in Nursery, the curves crossed between the fourth and fifth month, with Foundlingshome showing a steady fall until the end of the first year and Nursery showing a steady rise. All the factors of similarity and dissimilarity between the two homes were carefully recorded, and the relation of each of them to the developmental quotient was worked out. Using the same material, Spitz draws atten-

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tion, in a second paper entitled "Anaclitic Depression" (7), to a syndrome appearing in some of the 123 infants examined, showing great similarity to what we later on call depression, in the second half of the first year. In all the cases which showed this syndrome the only significant fact in common was that the mother had been removed for external reasons for a period of at least three months between the sixth and eighth month of life. During the period of the mother's absence the developmental quotient went down considerably as the infants became completely inactive and withdrawn. Restoration of the mother within a period of three months led to a disappearance of the syndrome; in some cases this occurred within a few hours, with a correspondingly spectacular rise in the developmental quotient.

These objective investigations prove beyond doubt that the child's early ego development is closely linked up with his constant contact with the mother and dependent on this emotional tie.

To come back to the question of why the child can postpone the gratification of certain instinctive urges: against this original desire there stands an equally strong force, namely, the approval or disapproval of the mother, or the love or loss of love of the one object with whom the child has formed a strong emotional tie, and on whom he feels utterly dependent for his very existence.

If, therefore, modification of early instinctive drives is to proceed satisfactorily, there must be a strong and uninterrupted mother-child relationship. The reasons why such a relationship can be developed best within the family circle are obvious. The mother herself has strong feelings for her child, and has, at any given time, only one child of the same age to care for. She can, therefore, external conditions permitting, devote her love and time fully to the infant. To a certain extent this normal relationship can be replaced by giving the child a substitute mother, who fulfils most of the requirements of the real mother. But this substitution is very difficult if not impossible to achieve in even the best institution.

Experiences in war-time residential nurseries, well equipped and working under the best possible conditions, showed that at the end of the first and often also the second year, the children were in many respects far behind the developmental age of toddlers who had grown up under bad family conditions. Anna Freud (2), in *Infants without Families*, analyses the differences of instinctive and emotional development under nursery and home conditions, and comes, on the basis of her rich experience, to the conclusion that even with a full knowledge of all the factors mentioned, one is not able to create conditions in a residential nursery that will make them equal to the home environment.

(c) Super Ego Formation.

So far only the mother has been mentioned as influencing early development. It is quite true that the relationship with the mother during the first two years of life is much more obvious than with the father, although he is already becoming an important figure during the second year of life. The father represents the power and richness of the external world, and is considered

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even more omnipotent than the mother, as he reinforces her educational efforts. The influence of the child's relationship with the father, which, as with the mother, undergoes a complicated development due to the appearance of ambivalent strivings, becomes very strong and equally important in the development of the super-ego.

When the child, out of love for his mother, gives up a desire, for instance the pleasure of wetting, he can do so by identifying himself with his mother's demand. Unless the educational pressure achieves this step the child's behaviour will remain very unstable, and lapses will occur all the time as soon as the mother leaves the room. This identification with the mother's demands is the first step in the building up of a moral code in the child. The decisive step in super-ego formation, however, occurs as a result of the decline of the oedipal phase, towards the end of the fifth year. At this point the child gives up most of his sexual desires for the parents and in its stead identifies himself with the parent, especially with the parent of the same sex, but to a certain extent also with the parent of the opposite sex.

This identification is more far-reaching than any other identifications that have occurred before. It embodies an internalization of everything both parents have represented during these first years of life. From this time onward the child's actions are governed much more by the demands of his super-ego than by those of the real parents. Together with the internalization of the images of the parents there is an internalization of all the demands the parents stood for—that is to say, an internalization of the moral code prevalent in the child's environment.

The question could be raised whether the real parents are the best people with whom the child should identify himself and whose moral code he should adopt. One might suppose that wardens of a hostel with an impeccable character would offer better objects than many parents.

Needless to say this is not so. The basis for this identification is the strong emotional bond which the child has developed with both parents together with all the conflicts inherent in that developmental phase. Without the retaliation which the boy feels threatening from the father, whom he wishes to rival and remove, no real pressure is behind this process of identification and it may not take place successfully. I think we are all aware of the super-ego defects in institutionalized children, and especially in delinquents who come from broken homes. In addition, the child does not identify himself with the parents as they really are. When this identification takes place, the parents are still idealized and perceived as wonderful and omnipotent people. When later on the child realizes his parents' shortcomings, this will not harm his own moral code, which was formed after the picture of the ideal parents. I do not wish to imply that no difficulties occur during this time of super-ego formation, and that if only the parents are there no harm will be done. Quite the contrary. This time of the decline of the oedipal phase, which, as we have seen, is the last stage of infantile emotional development, is frought with dangers and dependent on the earlier development, many disturbances may occur: identification may take place, especially with the parent of the opposite sex, which may lead to homosexuality. The process may not achieve a satisfactory solution if

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aggressive instincts are too strong and are turned inward and added to the super-ego ; we regularly find this condition in later obsessional neurotics. The only statement we can make is that normal super-ego development is dependent on family life—the child must have parents to identify himself with.

There is interesting confirmation of these facts in Anna Freud's *Infants without Families* (2). Anna Freud shows how children, who had no fathers and children whose fathers were absent during their stay in the nursery, built up phantasies around these fathers, denying their death or absence and giving them supernatural powers. This shows that there is a tendency in children of our culture to look for parents, even if they are not present and even if they have never experienced family life. But there was a great difference in the super-ego development of these children and those who were growing up within a family, with a real father present. These phantasy fathers were made to conform with the child's wishes rather than to restrict the child's antisocial tendencies, and an identification with this phantasy father did not lead to the incorporation of an enduring ethical code. Anna Freud maintains that it is in this phase of personality development that institutionalized children are at a special disadvantage.

The development, therefore, of an ethical code that will be strong enough to govern the individual's future actions is dependent on the existence of family life.

I have tried to show by examples of three aspects of early emotional development the transformation of instinctive drives, the first object relationship and the formation of the super-ego, that family life is the place where this development can proceed most satisfactorily. There is no doubt that it could proceed much more satisfactorily if more attention were paid to educational work with mothers of children under five years of age. It is often maintained that disturbances in young children are due to wrong handling, caused by irreparable personality defects in the mother, but in my experience in the majority of cases the mother of the very young child, if skilfully handled, is able to adapt her treatment of the child to his needs as soon as she is made aware of them. Although this does not come within the scope of my paper, I felt that I could not close my remarks without drawing some attention to the amount of work which should be done in all those cases where children do live within their family.

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DYNAMICS OF CREATIVE ACTIVITY.

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" No collection of facts is ever complete because the Universe is without bounds, and no synthesis or interpretation is ever final, because there are always fresh facts to be found after the first collection has been provisionally arranged." A. Toynbee.

I.

UNDERSTANDING of the nature of art has been approached from aesthetic and psychological viewpoints. Below a critical survey is made of the pre-existing standpoints, attempting a synthesis of the diverse aspects. To avoid discursions only the main trends of the various researches are mentioned. All the remarks on art concern paintings, if not mentioned otherwise.

II.

Psychopathological studies into psychotic art inquired into the psychology of creativeness, but their aim of analysing and formulating the nature of creative activity remained unfruitful. These studies, following Mohr's work, at least established the descriptive terminology of " insane art." For instance, the schizophrenic mental manifestations in drawings were not only recognized and described, but they became part of the diagnostic armoury. Such symptomatological products in paintings are condensation of meaning, dominance of symbols, and pictorial agglutination; stereotypy, preservation, and over-elaboration; lack of integration, chaotic organization and inappropriate colour choice. Ultimately the investigators took two different directions. One group limited themselves entirely to descriptive activities, which enriched the diagnostic armoury but had little reference to the psychology of art (e.g. description of motor inco-ordination in drawings of seniles). The second group of investigators lost themselves in theoretical considerations resulting in concepts such as the " universal urge for expression . . . manifested in form tendencies " (Prinzhorn) or " the creative force of the subconscious " (Jung). Such postulates are akin to aesthetic postulates, inasmuch as they are non-biological.

Weygandt, when studying art products in relation to the artists, noted that mental illness may (1) extinguish art, (2) may not affect art, (3) may facilitate a dormant talent, and (4) may cause a change of style. All these classifications were elaborated by yet another group of investigators, who correlated the art products and life-histories of known great artists. The aim of these pathographists was to elucidate the aesthetically incomprehensible in some of the art products (Lange-Eichbaum).

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Although the concept "sublimation" to explain art activities remained unsatisfactory, psychoanalysis contributed to a deeper understanding of the psychology of art. It did so by analysing the functional significance of art products for the artist himself and by recognizing the function and nature of magic. Kris and Pappenheim emphasized that the psychotic artist creates in order to transform the real world. Thus the work of psychotics is part of the magic itself, in order to readjust to reality. Wulff seems to come to similar conclusions by emphasizing that the pictures of schizophrenics are unsuccessful attempts to restore the personality. If one were to attempt to generalize one would be inclined to state that every art product may be looked upon as subserving a cathartic function in the artist's struggle for readjustment. Analytical interpretations, however, are essentially psychopathological ones, involving controversial questions, such as the basically pathological nature and function of culture (Roheim). Maybe because of the over-emphasis on psychopathology, psychoanalysis succeeded in elucidating the dynamics of totemistic art, but failed to understand the murals of Altamira. However, as previously emphasized, the recognition of the functional significance of art products brought us nearer to the understanding of the nature of art.

Studies of eidetic phenomena revealed the presence of predominantly visual or eidetic imagery till puberty in over 40 per cent. of children, and the altered electrical activity of the brain of eidetic adults was confirmed by EEG. It appears, however, that children's mental phenomena are not so much dominated by eideticism as by perceptual factors. It was said that conceptual thinking proper probably does not fully develop till puberty. In the predominance of visualistic thinking children, primitives and schizophrenics show analogous trends. Schilder analysed drawings of patients with head and brain injuries and described formal elements resembling those of schizophrenic art products (changes of configuration, preservation, "horror vacui," etc.). He concluded that the basic disturbances are those of the figure background relationship, thus approximating to Goldstein's researches and the problems of gestalt formation. Goldstein also showed that patients suffering from receptive aphasia exhibit lack of conceptual thinking as expressed in their descriptive "visualistic" language. The significance of studying artistic products in connection with organic brain lesions directs the problems of artistic creation towards brain pathological analysis. Reitman in connection with bilateral prefrontal leucotomies noticed a transient creative activity in schizophrenics' paintings. He emphasized the presence of thought disturbances in the sense of concreteness.

From the experimental viewpoint stimulation of visual hallucinations by mescalin was attempted. It was found that the induced visual hallucinations were individualistic and dependent on the subject's personality, but that the common experience of the mescalin-intoxicated subjects was a disturbed time-space relationship.

III.

The simplest way of attaining a synthetic approach appears to be the application of the results of the enumerated studies to aesthetic definitions.

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Read's definition of painting is that it gives pictorial expression to ideas. Similarly, but in a more elaborated way, Newton defined art as being an original human conception made manifest by the skilful use of a medium. An artist, e.g. a painter, has to have original imaginations, or ideas in form of visual conceptions, and he has got to possess an urge, a desire to communicate them. He must have craftsmanship, which enables him to make "skilful use of a medium"—that is to say canvas, paint, brush, etc.

Of this definition the last point, namely craftsmanship, may not need analysis, as it is a commonplace that craftsmanship can be acquired by everybody to a certain extent. The problems of reproduction of form and shape are well defined and can be equally well taught and learned.

The requirement "original imagination of ideas in form of visual conceptions" can be analysed in connection with the aforesaid researches. Cassirer showed that the "situational" or concrete experiences of children, primitives, schizophrenics and of patients with organic brain injury are replaced by the "abstracted" attitudes of thinking in normal adults; he showed that this development of abstraction led to building up or rebuilding the world again. Goldstein expanded the concepts of "concrete" or "situational" and "abstract" or "categorical" attitudes as the basic modes of psychological existence. Thus he denied the pathological nature of the concrete attitude. Now to have "ideas in form of visual conceptions" involves the loosening of abstract concepts which in turn alters the world again, this being re-experienced from another "basic mode of psychological existence." The loss of conceptual thinking is replaced by visualistic thinking—that is to say, all experiences have an immediate visual quality. In this connection it may be recalled that the fundamental disturbance of the mescalin intoxication was an altered time-space relation, which was also noticed by Schilder in patients with head injury. Such experiences necessarily disturb the categorical abstract thinking opening, the way to visualistic thought processes. One of Guttmann's mescalin subjects complained: "Each word I thought was connected with a picture. This hindered my thinking, as the concrete pictures held me." Such observations suggest that the visualistic experiences of mescalin-intoxicated subjects run parallel with altered thought-processes. Furthermore these parallelisms seem well in accordance with the outlined grouping of observations, namely, that patients' artistic activity (painting) involves a disturbance of thought processes.

Schilder, Goldstein, Bychowsky and others observed that disturbed time-space relations are interconnected with body image disturbances, with magic experiences and with concrete attitudes. They observed that the perceptual functions of patients with concrete attitudes are accompanied by altered figure background experiences. In other words, in disturbances of conceptual thinking not only does the perceptual factor become dominant, but its elaboration altered as well; hence the quality of it becomes changed.

From the point of view of style, art products of painters can be subdivided into representational and ornamental paintings. The representational artist interests himself in problems of form, shape and craftsmanship. The ornamentalist's interest is focused on devitalization and on pattern. The representational artist is active, vital and romantic; the ornamentalist is passive

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and mystic. Thus the stylization is partly determined by typological motives. The representationalist brings in subjective elements by demonstrating his individualistic perception of the world, and by altering the actual reality. The ornamentalist modifies reality by affective selection of essentials, by geometrical simplification, by form repetition and multiplication and by bilateral symmetry (Kretschmer). Furthermore, Schilder and Levine emphasized that the appearance of geometrical forms suggests particularly primitive drives.

The alteration of style towards the ornamental, the dominance of pattern, are well known symptoms of psychotic art products. Pattern as an aesthetic concept means the subdivision of shape, or in broader sense, of space; its dominance may well be an expression of altered gestalt formation, the "horror vacui" and of primitive drives. But whereas the non-psychotic artist preserves the capability of retaining unity in elaboration, the psychotic is lacking in synthesis of the patterns. Hilderbrand emphasized this by stating that "what holds art together is its assertion of an ideal spatial unity in contrast to the surrounding space." Thus the organization of the figure-background relations is a significant character of non-psychotic paintings.

The "urge," "the desire to communicate visual experiences" was well analysed by the recognition of the principles of magic. It may be recalled that magic experiences are inseparably involved with projection of affects, with loosening of the ego demarcations. Contrariwise, the detachment of the ego from the outside world is one of the characteristics of abstract thinking. The only controversial point at this juncture is the question whether the magic is directed outwardly or whether it involves entirely the internal environment. From what has been said above this question would appear to be superfluous. With unacquired ego demarcations (animism) or loss of them (schizophrenia) no delineation can be made between external and internal reality, as they became identical. It is still the expanded or dissolved ego which is influenced by the magic. It should be noted that only 2–5 per cent. of the schizophrenic patients and about 8 per cent. of brain injured cases (of my own material) did show spontaneous creative activity. As magic experiences are found in far greater numbers in schizophrenics than creative activities, magic experience alone cannot be the only impetus to artistic activity.

Some synthesis is already apparent. Paintings, as creative activity of patients, depend on the discussed factors. The patient's thinking process as emphasized has to undergo alteration in the sense of loosening of abstractions replaced by visualistic thinking. Only if his experiences are of visualistic character, that is to say, the altered perceptual elaboration is dominant, will he become a painter. The altered perceptual elaboration denotes disturbed gestalt formation based on altered time-space experiences. Head emphasized the importance of the equipotency of all cortical integrative impulses. It appears that in artistic activity, which can be looked upon as one of the highest integrative functions, this equipotency is altered in favour of visualistic elaboration. But the artist has to possess magic experiences as well, in the form of altered affects, to have sufficient urge to give pictorial expression to his experiences. The coincidence of all those factors together with technical possibilities offers the basis of creative activity of the patients. As this co-

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incidence is irregular it may explain the relatively low incidence of artistic activity in hospitalized patients.

IV.

In the foregoing, criteria of creativeness in patients have been outlined; now the applicability of these criteria to artists in general should briefly be examined. The difference between creative artists and non-artists is not determined by the artist's craftsmanship, but by his qualitatively different experiences. Because the artist thinks in visual terms his conceptions are of the concrete type. This, of course, does not imply that artists are lacking in true conceptual thinking, but that in them the basic modes of psychological experiences are mixed. The altered elaboration of the perceptions is present in the non-psychotic artist to a degree. Seeing things in the fire, or in the clouds, Leonardo's advice on inspiration, etc., are some random instances of this.

In support of this hypothesis a group of painters and a group of non-artists were matched for chronological age and vocabulary age (on the Shipley scale). Both groups were tested for conceptual thinking with (1) a modified version of the Vigotsky test and (2) a verbal card-classification test, where only an abstract grouping would yield the required number of groups, but in which an alternative situational classification was strongly suggested. The sample as yet is small for the results to be statistically significant, but the differences in the meantime taken, together with the accompanying remarks of the subjects, were indicative that the artists found greater difficulty in breaking away from a suggested perceptual or situational grouping to a more abstract one. Further psychometric investigations are still continuing.

Magic experiences of non-psychotic artists have been evaluated analytically, and the revitalization of the environment in creating a picture is a magic action itself, strongly motivated by subconscious factors. On the other hand, in psychotic art the subconscious appears directly, and not merely as a motivating force.

The striking similarities between the so-called modern and the psychotic art gain in significance as the former is increasingly appreciated. Art appreciation is a cathartic experience, accompanied by a factor of distance (Bullough, 1912). But art appreciation depends on ideational and perceptual conditioning of the social environment. As long as the artist employs appreciable patterns, his work may induce response, hence it fulfils a social function. Modern art, as a result of individual and social interaction, re-conditioned our perceptual appreciation. Later on, however, modern art not only broke away from habitual patterns, but the choice of content altered as well; the surrealists choice for instance is the direct representation of the subconscious itself. Dali's definition of surrealism is that it is the art of a "critical paranoiac," in other words, surrealism is a conscious mobilization and utilization of schizophrenic mechanisms. If Dali did suffer from a schizophrenic episode, his paintings depict true experiences. The surrealists, however, attempt artificially what Dali might have done with spontaneity. Their art products

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are only significant because these pictures represent contemporary personality trends; they reflect on strong destructive tendencies in our present-day attitude.

V.

Finally, the other creative arts should be briefly examined in connection with the problems discussed. Prinzhorn and several other workers were able to extend their observations on painters to psychotic sculptors as well. The rarity of psychotic sculptors can be explained partly by the technical differences between painting and modelling. Although both arts are visualistic and concerned with problems of space, the sculptors' experiences are restricted to shape and mass. It is probable that as sculpture involves more craftsmanship, the pleasure value of handling the material itself is greater than the use of brush and paint. In general, however, all that has been said about psychotic painters is also applicable to psychotic sculptors, and the parallelism between the psychotic and normal holds just as it does for painters.

Composing is less hampered by technical difficulties in hospitals and institutions, yet the number of observations on musical compositions is not extensive. This is to be expected, since composing denotes the organization of musical ideas by musical symbols which are of the most involved conceptual or abstract quality, and it may be added that their configurational value is higher than those of the mathematical symbols. The symptomatological points in composition, such as oddities, musical verbigeration, poverty of melody, or flight of melodies, etc., have been described. Felber, Rentsch and others noted the hypertrophy of tempo and rhythm at expense of melody in compositions of the mentally ill. Clinical investigations into amusia showed that the propositional value of music is negligible and that amusia is greatly determined by affective factors, and cerebral localizatory attempts have been refuted (Feuchtwanger).

Cognitive changes, such as disturbed time relations, altered gestalt functions, hypertrophy of affective elements may well be found in psychotic music. In drawings of psychotic artists the dominance of pattern was demonstrated, and it was shown that this is partly determined by primitive drives. The " horror vacui " as one of these drives was mentioned, whilst altered gestalt formation was considered in the perceptual sphere. Now music is a temporal and not a spatial art. The dominance of tempo and rhythm in psychotic music (*vide supra*) represents a regressive phenomenon towards more primitive drives. The filling in the space as an expression of the " horror vacui " finds its counter part in filling in the time as an expressior of " horror temporis." The loss of sense of melody may well be an expression of altered gestalt formation as melody is an organized unit. Furthermore, an opus as such has a configurational property, and this completeness of music is also lost in the psychotic compositions. The dominance of the affective elements does not need special emphasis; music is fundamentally affective, and the magic component of it was known before it was formulated.

Finally literary art was the subject easiest to approach psychopathologically. Pathological phenomena, such as described in connection with paintings,

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found innumerable expressions in the literary art activities of patients. But they have merely symptomatological significance. Pathographies are numerous, and those of known authors have been written and re-written by members of various psychological schools of thought.

Literary art operates with abstract concepts; if those are lost the work becomes merely of symptomatic significance. If the conceptual element is merely loosened the pattern of words becomes dominant over content, and nonsense poetry develops. This is the only literary manifestation of the shift of conceptual thinking towards perceptual thinking. When analysing the nonsense poetry of Edward Lear, Reitman drew attention to the manifestation of body-image disturbance, and Schilder emphasized the expression of distorted time and space relations in Lewis Carroll's nonsense. Thus the same mechanisms are at work as were mentioned in connection with head injuries and mescalin intoxication. Although one can look upon poetry as a hypertrophied gestalt formation of verbal nature, the art of words does involve perceptual factors only to a lesser degree and demands abstracted thinking. Verbal magic, too, has been analysed and described. Literature, however, is essentially propositional, that is to say subserves a conscious appeal to the outside world, and because of the appeal to the outside world the importance of external influences (the appeal of ideologies) is evident. Magical expression as well as perceptual dominance are isolated instances.

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THE MEDEA COMPLEX: THE MOTHER'S HOMICIDAL WISHES TO HER CHILD.*

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Δύναται γὰρ ἴσον τῷ δρᾶν τὸ νοεῖν.—Aristophanes.

(" To think evil is very much the same as doing it.")

INTRODUCTION.

A COMPLEX is a group of emotionally invested ideas that have unconscious activities. Contrary though it be to the popular and sentimental idea of an overriding mother love, it is common, especially in child psychiatry, to find a mother's lively hatred and even homicidal wishes towards her child. I consider that this should be called " The Medea Complex."

CLINICAL.

The following cases illustrate it—the first five in increasing severity, while the sixth shows that the death wishes may be directed against the unborn child in the womb, and the seventh that the presenting symptom may be the mother's dread that she will injure her child.

CASE 1.—Jack, a 14-year-old child, was brought to the clinic in March, 1941, by the Probation Officer with the complaint that he had been dismissed from two posts for stealing, and had been convicted by the Court. His father, a railway clerk of 48, had lost a leg in the war of 1917, and apart from trying to shield Jack, was something of a cypher in the case. His mother, superficially agreeable and attractive, was a hard, aggressive woman of 43, formerly a manageress in a shoe factory. The home was materially comfortable. Jack had undergone painful circumcision when sixteen days old, had later had a septic thumb after measles, and when six years old suffered from pneumonia followed by empyema, drained by operation. His mother had tried to beat Jack into shape, occupied herself much with punishment, and showed him great hostility, giving a long account of his numerous misdeeds. She ended her story by recounting with ill-concealed satisfaction how when she had fetched him from the hospital after his illness, the ward sister had said, " I am very pleased to get rid of this young man of yours ; he looks very angelic—but my word ! " From the way in which she related this it was evident that those were really her own sentiments, and that she wished that she too could have rid herself of him.

The boy did well with treatment, in the course of which he showed an exceptional amount of unconscious fear of his mother.

CASE 2.—Harriet, an adopted child, aged 8, was brought to the clinic by her mother in November, 1936, with the complaint that she was beyond parental control. Her father was a clerk of 47, the mother being 36. After ten years of childless marriage hysterectomy had been performed, and a year later Harriet was adopted when eight months old, being chosen because she was dark like the

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parents, and so might pass for a natural child. They were of only moderate intelligence, but Harriet turned out to be brilliant, and she repeatedly outwitted them. Her mother was smug, and her feelings for Harriet were ambivalent, with a half admiring " I would never have dared when I was a child " attitude and a considerable overt hostility. Harriet accosted men in the street and asked for money. She even took to stealing. Her mother said " I detest the child," and " I feel I could strangle her."

At the end of three months Harriet was a little better, but her mother broke off treatment, possibly because she was dissatisfied that we had not proposed the expulsion of the child from the home.

CASE 3.—Peter, aged 5½, was brought to the clinic in May, 1944, by his mother, who complained of his screaming, nervousness, restlessness, fear and naughtiness. His father was a soldier of 30, who had been away for three years. The mother, who was 31, had little idea of managing children, and showed increasing hostility to Peter, though she was tolerant of her other child, a baby boy of 20 months. She herself had been brought up in ignorance of sex, which she had never been able to accept, refusing intercourse for the first two or three years of marriage, and then only acquiescing with disgust. Peter was born after an operation for sterility, and his birth was followed by dyspareunia. Husband and wife quarrelled a great deal, and accused each other of unfaithfulness. Separation was contemplated. Peter's mother was angry and vicious to her husband and said that he was sulky and quick-tempered, and that Peter took after him, having an evil mind and being extremely jealous.

Peter's birth had been normal, he was bottle fed, and circumcised when ten days old. From the age of 2½ to 3 years he was billeted with a foster-mother, and on his return home he caught measles, followed by spilling some boiling fat over himself, and then by mumps. His intelligence was average, but he was actively hallucinated, and a diagnosis of dementia praecox was made.

His mother became more and more aggressive towards him, and was reported to give him little attention. She insisted that he must be sent away, and repeatedly said and wrote to us that she feared she would " do something to him," as he was working her up to such a pitch that she did not know what she was doing ; already a friend had had to stop her from attacking him. She applied for her husband's compassionate release from the Army, and stated that if it was not granted she would take the baby with her and leave Peter alone in the house. Soon after this she put him in a room by himself, out of the way, as she could not trust herself with him. She complained that he had made her really ill, so that she had to spend a fortnight in bed. But she resented any suggestion that he was suffering from a mental illness, although later she asked if he would " go funny," and said that if anything like that happened to him she would kill herself.

Peter was so unmanageable that it was with great difficulty that an institution was found willing to accept and keep him, but each time he returned home the situation again deteriorated, and so finally he had to be permanently boarded out in a mental hospital which contained a children's unit.

CASE 4.—A single woman of 28 was seen in a general hospital in November, 1946, for an opinion on her sanity, since a charge of attempted murder and suicide was pending against her. She had been a nursing auxiliary and had fallen in love with an epileptic soldier patient, who bigamously went through a form of marriage with her in 1944. He himself was seen as an out-patient in March, 1946, when he said he was happily married, and was found to be a severe epileptic. The home was squalid. His offence was detected and he was convicted, but although he was violent to her and she was urged by her parents to leave him, they continued to cohabit. In August, 1945, she bore him a daughter, and three months later they moved to a new slum address. During the next twelve months he deserted her six times. On one of these occasions, in November, 1946, when she was almost destitute and without any coal, her landlady called for the rent, which was a fortnight overdue. Whilst they were talking he returned and became abusive. This made her desperate. As soon as she was alone with the child she swallowed 25 of his one-grain phenobarbitone tablets, put her head and that of her child in the gas oven and turned the taps on.

Hearing the baby crying and finding the door locked, the neighbours sent for the police, who broke it down. There was little injury to either party, and the patient, who left her supposed husband to return to her parents' home, was soon

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afterwards bound over for two years at the Assizes. She had shown no antipathy to the child, but it appeared that the severe aggression in her attempted infanticide was really directed against the husband, and psychologically this case has much in common with the situation in Case 6 below.

CASE 5.—A married women of 32 was first seen at an out-patient department in March, 1936, when she was depressed and self-accusatory, and it was complained that she rapped on the walls, rubbed dogs' excreta on her neighbour's child's clothing, door and gate, and stuck pins into her husband in bed at night. She voluntarily entered the mental hospital in April, 1936, but only stayed for a fortnight, and was readmitted under certificate ten days later. There was a history of her having been an industrious and conscientious young woman, who had married an indolent, inconsiderate fellow, and bore him a female child in December, 1935. The marriage had been unhappy from the first; he spent the whole of each morning in bed and gave his wife no help, and so things deteriorated to an extreme degree. In February, 1936, the child had been found dead in her cot, and at the inquest a verdict of accidental death was returned, it being supposed that she had accidentally smothered herself in her pillow. But the patient now stated that she had left her husband sitting downstairs, gone up to her child's cot, and smothered her with pillows. The husband denied this, stating that his wife had not left his side for the whole evening.

The patient went through a period of regression in which she was destructive, and degraded in her habits. She was miserable, showed intense guilt, and asked what the police would do to her when she left hospital. She said that she had killed her baby because she thought she was going to die and did not wish to leave her, and also that she had done so to bring her husband to a more sympathetic frame of mind. Finally she recovered after psychotherapy, left the hospital in August, 1938, rejoined her husband, and subsequently bore him another child.

CASE 6.—A married woman of 24, wife of a 26-year-old sergeant in the R.A.F., was seen in a general hospital in May, 1946, for hyperemesis gravidarum of four months' duration. Although she was said to be really ill and was depressed, she was lying beautifully posed in bed, well made up, wearing an elegant nightgown, and with her belongings tastefully arranged around her. The picture was that of a strongly narcissistic woman.

She stated that her parents were divorced when she was twelve, and that she had been married for five years. This was her third pregnancy and she had suffered from vomiting during each one. The first was ended by therapeutic abortion for hyperemesis at five months, and the second was a boy now three years old. She gave a history of emotional rejection of her husband at every coitus since the abortion, and said that she could not bear him. He himself gave a history of marital incompatibility. She asked the doctor to terminate her pregnancy, and if possible remove her ovaries as well, and said that when vomiting she hoped to get rid of the baby by the mouth.

She was unwilling to accept mental treatment, and as her condition deteriorated the pregnancy was terminated.

CASE 7.—A married woman of 37, previously a nurse, in which profession she had found her only happiness, was seen as an out-patient in August, 1942. She was tense and tearful, and said that her childhood had been unhappy because her mother had ill-treated her. The patient had been married for two years and complained that her husband, from whom she had separated for a time, did not understand her, being pig-headed and cool. Her daughter, Jean, had been born in February, 1941. Pregnancy and birth were normal, and Jean was bottle-fed. As soon as the patient got up she felt nervy and Jean's crying upset her. She said, "My one dread is that I should be cruel to my baby as my mother was to me." She had illogically sent the baby to her mother three months before and had felt much better since then.

A month later she was admitted to the Neurosis Unit as a voluntary patient because she was more depressed and feared she might kill Jean. She was agitated and melancholic and complained of impulses to infanticide and suicide. Following treatment by narcosis, she left recovered in December, 1942, after a three months' stay.

She was readmitted in April, 1943, with similar symptoms and left two months later slightly improved. She returned to hospital in July, 1944, with a mild recurrence, and left relieved after three weeks.

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She was again admitted in May, 1947, with simliar symptoms, though she no longer had a fear of injuring Jean, now six years old, but she now had a son Joseph, of 2½ years, whom she feared she would injure or kill. She also had suicidal thoughts. She left hospital recovered at the end of two months.

The first five cases form a graded series, from the common type (Case 1) in which the death wishes are not openly expressed, but are put into the mouth of some third party, often a school teacher, through the avowedly antagonistic parent (Case 2) who still keeps the child, and the still more hostile parent (Case 3) who disposes of him to a third party, to the case of attempted homicide (Case 4) and even probable actual murder (Case 5)—both of these last two cases being, like Medea, intensely depressed at the time of the event. Hostility between the parents was not apparent in Cases 1 and 2.

Case 6 is an example of rejection of an unborn child in a narcissistic woman, with hostility to her husband. It shows how the essence of the Medea situation can exist even in pregnancy.

Case 7 discloses a state of affairs sometimes found in melancholia, in which the mother is hostile to the husband and complains of such dread and apprehension of murdering her child that she is afraid to leave hospital or to look after him, but represses the actual homicidal wish.

Dyspareunia was prominent in Cases 3, 6 and 7, and appeared to be related to fear of pregnancy, due to dislike of the baby in the last two, and perhaps in the first.

Anthropology.

The killing of children seems to be general at a stage of civilization. It usually takes the form of child-sacrifice (Crawley, 1913), and is almost unknown in a savage society, i.e., one that depends for its livelihood exclusively on hunting, fishing and collecting (Childe, 1944), but common amongst barbarians, i.e., those who augment their food supply by cultivating edible plants, breeding animals for food, or combining both activities, and in some civilized peoples, i.e., those living partly in cities. Even down to our own time the penal sacrifice of offenders has outlived all others and is still accompanied by a religious ceremony. Human sacrifice is a sort of life insurance for the survivors, and may be compared to the slaughter of battle, the execution of prisoners of war, heretics and unbelievers, the *auto-da-fé*, devotional suicide, hara-kiri, and suttee. The victim is not chosen at random, a king being substituted for his people and a mock king or other person for him, a son for a father, and so on. He is regarded as a messenger to the gods. According to the Western Church, Christ discharged his punishment, due to the sins of mankind, and propitiated his Father's justice, in the capacity of a man, as a representative of the human race. The Greek Church regarded the death of Christ as a ransom of mankind paid to the Devil. In Morocco if a child dies it is customary to congratulate the parents by saying, " Your child took away your misfortune."

In China (Ball, 1913) about 587 B.C. a man buried two daughters with the King to whom he was grateful for his clemency to his father. It was, and may still be, the custom for new pottery furnaces in the Kiang-si Province to be

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consecrated with the secret shedding of children's blood. Female infanticide was prohibited in 1873.

In Ancient Greece it is said that children were sacrificed to Melikertes at Tenedos (Grote, 1903), and girls were habitually exposed to death as soon as they were born. In his life of Lycurgas, Plutarch states that the Spartans threw all weakly and deformed children into the cavern Apothetae. The Boeotians would sacrifice a boy to stop a pestilence.

In India (Cait, 1913) at the beginning of the nineteenth century, the British Government stopped the practice by which Hindu women in Bengal consigned their firstborn to the Ganges in fulfilment of a vow to do so if blessed with a son. At the shrine of Kali at the great Saiva Temple at Tanjore, a male child was sacrificed every Friday evening until British rule forced the substitution of a sheep.

Among the aboriginal tribes of North-East India, the Chutiyas used to sacrifice the children of one particular clan, which received certain privileges in return. When a woman of this clan became pregnant astrologers were called in, and if they predicted a boy she was carefully tended and the baby anointed with a paste made of turmeric and a kind of pulse. Later, he was kept at the temple and fed sumptuously until plump enough to suit the goddess's taste. He was then shaved, anointed with the paste again, adorned with gold and silver ornaments, and conducted before the goddess's image, where he prostrated himself and was then decapitated by the high priest.

The Dravidian Bhumji kidnapped children for sacrifice, as did the Bhuiyas. Before beginning a journey the Banjaras, or pack bullock drivers, used to drive their bullocks over a child buried up to the shoulders. The Khonds used to sacrifice children to the earth goddess to avert misfortune and disease, gain victories, and ensure good crops. The victim was only acceptable if purchased, dedicated by his father, or himself the son of a victim. Khonds in distress sometimes sold their children for sacrifice, and they were often kept for years before being offered up, usually at the sowing of the chief crop, and to the accompaniment of music, dancing and other ceremony. Portions of the victims were divided amongst the householders of the villages, and buried in the various fields.

In the North of the Upper Chindwin district of Burma, small children, usually bought from the unadministered territory, were sacrificed at a big festival in August in order to induce good rice crops.

The Angami Nagas were head hunters, and a man was not allowed to don full warrior's insignia until he had killed a human being, even a child speared from an ambush, probably because the person whose head was taken would be his slave in the future life.

There is a superstition throughout India that buried treasure belongs to demons who must be mollified with blood before it is sought or removed. In Southern India the demons prefer the blood of a pregnant woman, who was therefore formerly sacrificed. It is also believed that large buildings and public works require the burial, in their foundations, of human beings, whose spirits will haunt and guard them; thus a local landowner had a girl killed and buried under an embankment that had collapsed several times. Since human

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blood is believed capable of producing magical results, a man of Sibsagar decapitated his neighbour's son in 1854 and drank his blood in order to bring about his own child's recovery from fever, and similar acts are recorded in the present century, with the object of ensuring male or healthy offspring.

In Persia (Edwards, 1913), according to Herodotus, Xerxes and his wife Amestris buried some youths and maidens alive.

Roman law recognized under the *patria potestas* the right of the father to murder his own children. Didius Julianus sacrificed children in order to learn the future, and Elagabalus slew children and practised magic (Wünsch, 1913). At the "sacred spring" the Latins presented to the gods all the offspring of men and cattle born within a specified period. Mommsen (1901) naïvely excuses this by stating that the humans were confined to the convicted, or to the innocent who chose to die.

In Egypt it was customary (Macalister, 1913) to cast a young girl, designated as a bride, into the Nile every year in order to ensure its flooding, and in the holy place or Adytum of Serapis at Alexandria the heads of infants were preserved with the lips gilded. The fallahin are said still to bury untimely births in the corners of their houses. In Assyria, as a penalty for a breach of contract a son or daughter was burnt on an altar. The savage Assurnasir-pal's triumphant inscription boasts, "I burnt their boys and girls in the fire." The earliest prescription for child murder appears to be an Assyrian one (Gadd, 1946) of the 6th to 5th century B.C., that a human embryo was to be sacrificed to help glass making magically. The Bible (II Kings, xvii, 31) records of the people of Sippar, in Syria, who were planted in Palestine during the Babylonian captivity, that "the Sepharvites burnt their children in fire to Adramelech and Anammelech, the gods of Sepharvaim."

Of the predecessors of the Hebrews it is said (Deut. xii, 31), "Their sons and daughters have they burnt in the fire to their gods." (See also xviii, 10, and Leviticus xviii, 21.) The bones of newborn infants were found in jars in the High Place at Gezer (Macalister, 1912), as also were the skeletons of a youth and maiden sawn in two. Similar discoveries were found in or near the foundations of houses, and at Megiddo a girl had been slaughtered and built into a new foundation wall. The Arabs were stated by Pliny to slaughter children in order to procure baths of their blood for the treatment of leprosy, and they sacrificed boys to Dusares and the morning star. There is also the well-known incident of II Kings, iii, 27, mentioned by Josephus, in which Mesha, King of Moab, sacrificed his son on the wall to Chemosh, which struck terror into the victorious Israelites, who fled (Frazer, 1936). It is possible that the early Hebrews sacrificed their firstborn, in which case the story of Abraham and Isaac (Genesis xxii) may represent a turning point at which the practice ceased, though circumcision may be a relic. There were lapses, such as Jephthah's sacrifice of his daughter (Judges xi), which were condemned (Ps. cvi, 37-8; Jeremiah xix, 5, etc.). On these occasions it appears that the firstborn were burnt (Micah, vi, 7) as an atonement.

Hiel (I Kings xvi, 34) rebuilt Jericho upon two of his sons, constructing the foundations upon the eldest and the gates upon the youngest. In the Northern Kingdom (II Kings, xvii, 17) and the Southern under Ahaz (xvi, 3) and Manasseh

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(xxi, 6) children were sacrificed by fire, and in the time of Jeremiah a special place, Ge Ben-Hinnom, had been dedicated to this rite. Frazer (1936) suggests that the tenth plague of Egypt (Exodus xi) is a later reversal of the facts, and that really the Israelites slew their own firstborn as a sacrifice. He also suggests that masked men went round slaying the Egyptian firstborn, and that the blood smeared on the lintels and side posts of the doors in order to distinguish the abodes of the Israelites is to be compared with the white scarves of the Catholics at the massacre of St. Bartholomew's Eve. Perhaps the facts would be better explained by an outbreak of undulant fever killing the embryo men and beasts and later altered to the tradition of the firstborn.

The Carthaginians annually sacrificed some of the freemen of the best families to Baal-Hammon ; they were selected by lot. But later the families used to buy and bring up children whom they offered as substitutes. In times of disaster children were sacrificed to Saturn ; e.g., in the fifth century B.C., Himilco, the Carthaginian general, tried to save his army from a plague by sacrificing a child. In 310 B.C., when besieged by the Greeks, the Carthaginians offered up 500 children, because they feared that the god was incensed by their frauds. The victims were placed in the statue's arms, whence they rolled into the fire.

King Aun of Sweden sacrificed a son to Odin every nine years in order to prolong his life (Frazer, 1936, *cf.* Mogk, 1913).

The practice of stabilizing a building by enclosing children in its foundations survived in dykes by the sea coast in Oldenburg up to the seventeenth century, and it is still symbolically represented in our foundation stones.

The Chippewa Red Indians, suffering from an epidemic, regarded it as a divine punishment for their wickedness. The most beautiful girl of the tribe was set adrift in the river and allowed to drown in order to stay the plague.

The Aztecs of Mexico (Prescott, 1888, 1) sacrificed and ate children on a large scale, and the same happened on a smaller scale in the Empire of the Incas (Prescott, 1888, 2).

Amongst the Australian tribes infanticide by exposure, choking with sand or knocking on the head is common (Porteus, 1931).

Numerous other examples of child murder are recorded by Frazer (1936), and also by Miller (1928), who, however, takes the view that this was usually a matter of convenience or economics.

In Britain it is reported (Wickwar, 1925) to have occurred as a sacrifice to the presiding devil of the coven in witchcraft. Only a century ago *The Times* (Saturday, 26 June, 1847) expressed alarm at the rapid growth of infanticide.

It may be urged that in most of the above examples the child is not actually killed by the parents, but such a widespread custom can hardly have developed without their co-operation, which must have resulted from a strong urge. In our own times murder of the child by the mother is only too common, and has called for special legislation, which was formerly savage (*cf.* Scott's *The Heart of Midlothian*), but is now more merciful in the Infanticide Acts of 1922 and 1938.

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LITERATURE.

In Greek Mythology Medea kills her two sons as a revenge against her faithless husband, Jason, and this has been dramatized by Euripedes, who also wrote the *Mad Hercules*, in which the latter murders his children. Agamemnon sacrificed his daughter Iphigenia, the story being similar to that of Jephthah. Cronos ate his children, except Zeus, for whom a stone was substituted, this story being of Hittite origin. Atreus killed his son, Plisthenes. The Amazons were said to kill all their sons.

In drama only five examples of child murder were found. In Goethe's "Faust," published in 1790, Margaret kills her baby, but the deed is to some extent excused by Faust saying, at the beginning of Scene 25, that all her crime was a delusion. In W. B. Yeats's "On Baile's Strand," Cuchulain kills his son, though ignorant of his identity. In the play "Huis Clos," by the existentionalist, J-P. Sartre, Estelle has drowned her illegitimate baby in a Swiss lake.

In Hugo's "Le Roi s'amuse," the jester Triboulet, having plotted the death of his daughter's lover, is the unwitting instrument of her murder when she assumes the lover's disguise.

Finally, in the "Punch and Judy" show every child is familiar with infanticide by the father, though this may not long be so if other authorities follow the lead of the Middlesex County Council Education Department (*The Times*, Tuesday, 10 June, 1947, p. 4), who refused to subsidize its performance in their parks, on the specious ground that it was not "educational," but possibly owing to their unconscious resistance to the theme.

Shakespeare does not use the theme of parental infanticide in any of his plays, but he recognizes its dramatic possibilities :

> "I have given suck, and know
> How tender 'tis to love the babe that milks me ;
> I would while it was smiling in my face,
> Have pluck'd my nipple from his boneless gums,
> And dash'd the brains out, had I so sworn as you
> Have done to this."
>
> *Macbeth*, Act I, Scene 7, lines 54–59.

In opera (Kobbé, 1933), with its greater scope for melodrama, the theme is relatively more common. In Gounod's "Faust," Marguerite is condemned to death for killing her baby, and in Boïto's "Mefistofele" she is imprisoned for drowning it, both libretti being founded on Goethe's text. Verdi's "Rigoletto" is based on Hugo's play mentioned above.

In poetry Matthew Arnold has utilized the Iranian legend of Sohrab and Rustum, in which the latter, the Persian Hercules, unwittingly murders his son.

There does not appear to be an example in fiction, although Hetty Sorrel abandons her baby in George Eliot's novel *Adam Bede*. In general literature I do not include Swift's *Modest Proposal for Preventing the Children of Poor People in Ireland from being a Burden to their Parents*. This sarcasm is a curious reversal of the old custom of English parents selling their children to the Irish for slaves, until prohibited by Canute in 1017.

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Discussion.

The most famous and important complex is that described by Freud (1909), about 1900, as the "Oedipus complex," and named by him after the Greek myth and the tragedy "Oedipus Rex" by Sophocles (496–406 B.C.). In the case of women the corresponding Electra complex is so-called after the legend dramatized by Aeschylus (525–456 B.C.), Sophocles, and Euripides (480–405 B.C.). Although the phrase "Electra complex" was never accepted by Freud, who preferred to call it the female "Oedipus complex," it is remarkable how often in such cases the emotional attachment is to a dead father, corresponding to the dead Agamemnon, father of Electra.

This method of describing the deepest and most unwelcome impulses of the human spirit by a simple, if cryptic phrase has the advantage of euphemism, brevity, and the recognition of the penetrating insight of the Greeks. Indeed, Aeschylus seems to have exposed the root of such problems, ambivalence, in his phrase, "ἀπέρωτος ἔρως" (unloving love). As Money-Kyrle (1939) has pointed out, psychoanalysis has shed much light on Greek mythology. Mythology in its turn can clarify psycho-pathological problems. Freud (1936) pregnantly remarks, "I do not assert that the oedipus complex exhausts all the possible relations which may exist between parents and children."

Three possible explanations of the tenth plague of Egypt at the time of the Exodus have been given above, the survival of which story in its present form appears to be based on the Medea complex. A cognate matter which has long puzzled historians and shocked educated people is the repetition of the baseless accusation of ritual murder of Christian children by Jews in order to obtain their blood for the celebration of the Passover or anniversary of the Exodus from Egypt. A well-known example is that of Little Saint Hugh of Lincoln in Chaucer's *Prioress's Tale*. The last time this libel was published was by Julius Streicher in his periodical, *Der Stuermer*. As usual, the charge was a direct incitement to murder, followed by pogroms and massacres. These were specially aimed against the children, e.g., that of 17 June, 1942, when all the Jewish children in Paris were killed. In the light of the Medea complex the matter is clarified. The accusation is a projection of the accuser's desire for the death of his own offspring, and this death wish is later symbolically fulfilled by the murder of the victim's children. The same explanation holds for many other false accusations of cruelty to children, as well as for their actual ill-treatment.

It is significant that, although infanticide is so common in fact, it is rare in fiction. Even in the examples quoted it is often partially excused. Indeed the "Medea" itself was a failure when first published. Doubtless the reason is that the theme is too repugnant to our sentiments to be easily admitted to consciousness.

Fleeting death wishes against the children must occur in most parents—which of them has not at some time thought, or even said, "Oh, drat the child?"—but these wishes often remain unconscious, since there is a strong prejudice against their recognition, perhaps for fear that this would disrupt family life. It might be urged that in the case of a daughter this situation is merely one

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aspect of the Electra complex, but Deutsch (1946) has pointed out that it is untrue that the girl's childish relationship to her mother ends up in hatred, and that in normal cases the attachment of daughter to mother is a lifelong one, quoting D. H. Lawrence's—

> " A son's my son till he takes him a wife,
> But my daughter's my daughter the whole of her life."

This is a salutary reminder that we must not over-estimate the strength or persistence of the Electra situation. Indeed Freud (1924) has stated that the Oedipus complex passes away at the end of the phallic stage of early childhood.

I have suggested that the complex described in this paper be called the Medea complex. It is true that Wittels (1933) has already described as the Medea complex the death wish of a mother towards her daughter, but thus used it is a misnomer, for Medea had no daughters.

If a separate name from Medea is needed for the like situation in a father and his offspring, I suggest the phrase "Atreus complex."

It is important that the true situation should be fully recognized by the psychiatrist, so that in dealing with the relations of parents and children it can be borne in mind, and the possibility of all degrees of covert or overt acts of hostility to the child can be considered, e.g. it is surprising how often a baby is weaned on such specious pleas as that the mother's milk did not suit him, i.e., it was poisoning him, the unconscious wish being father to the thought. In such cases too, a search should always be made for a conscious or unconscious hatred of the husband.

Summary.

(1) The situation in which the mother harbours death wishes to her offspring, usually as a revenge against the father, is described and named the Medea complex.

(2) It is shown that there is considerable resistance against admitting these thoughts to the consciousness of the mother or any other person, but that they are of general occurrence.

(3) The Medea complex causes many marital difficulties, e.g., dyspareunia, prevention and interruption of pregnancy, failure of breast feeding, and other disordered domestic relations.

(4) It explains such matters as baby farming, disposal to others, and neglect of children, unjust accusations of cruelty to children such as blood libels, and acts of covert and overt cruelty to them.

I thank my friends, and in particular Dr. T. Wishart Davidson, for permission to quote Cases 1 and 5, Dr. W. Paterson Brown for Case 2, Mr. Richard Barnett of the British Museum for advice on archaeology, and my staff at Hatton for their constant help and interest.

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THE EFFECT OF LEUCOTOMY ON CREATIVE PERSONALITY.*

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In some of our earliest investigations into the effect of leucotomy we used the Rorschach test, hoping thereby to obtain a fairly full and clear-cut picture of the personality changes produced by the operation, but it was found that this test had the disadvantage that, when repeated, memory of the previous test or tests to some extent minimizes the validity of the later interpretations.

The results obtained, however, did seem to indicate that leucotomized persons show somewhat less originality and creativity than normal people of the same age, social status and educational background. It was found, and I think our findings agree with others who have used this test, that although leucotomized patients are co-operative and quite unhampered by any nervousness, timidity or self-consciousness, they show no enthusiasm and make no great effort; their answers are usually given fairly quickly and briefly, and tend to be conventional responses evoked by large obvious details; they are content to give one or more of these, and then pass on to the next card. If they do not readily find anything they have no hesitation in putting the card down unanswered after quite a cursory examination of it. In cases where we were able to get a pre-operative record many of the post-operative responses are mere repetitions, rather more accurately described and with the more bizarre details omitted. Although human and human movement responses are introduced post-operatively they are relatively infrequent, and the majority of new answers are evoked by colour, or in some cases by texture, and are mainly conventional animals or objects. The introduction of new shading responses is relatively uncommon.

Later the individual test was supplemented by the Multiple Choice Method devised by Harrower-Erickson. In this, 30 answers divided into three groups of 10, are suggested for each card, and the subject is asked to underline one answer in each group. The answers have been selected from those commonly given by normal and abnormal subjects, and are according to the table given below:

Scoring Values of Multiple Choice Rorschach.

Explanation of Numerical Values Assigned to Answers in Terms of Rorschach Scoring.

1. Human movement responses (Rorschach's M).

2. Animal responses either with or without movement, including many "populars."

3. Good form answers given relatively frequently by unselected normals. In the coloured cards 3 stands for Form-Colour responses (FC).

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4. Answer located in the small detail area of the card.

5. White space answers.

6. Anatomical answers with bad form (F-).

7. X-ray responses, clouds, and a few vague formless whole answers (leaf on card VI, animal skin on Card II, etc.).

8. Answer indicating an explosive response to Colour (CF or C answers).

9. Completely formless answers in uncoloured cards, including those indicative of unpleasant feeling tone in looking at the card (nightmare, etc.). In the coloured cards 9 stands for an evasion of the responses, or a mere statement of the colours on the blot.

10. Failure, the " nothing at all " answer.

Answers with scores between 1 and 5 are supposed to be those which occur most commonly in normal records and between 6 and 10 in abnormal records. Subjects with high scores in this test are, therefore, rated as being pathological.

Our results are here plotted in the form of a graph, comparing a group of leucotomized patients with a group of adult normals and a group of adolescents. In the leucotomized group the small number of human responses is noticeable, but the outstanding feature is the high proportion of the 9 and 10 responses ; 9 seeming to indicate a literal but rather casual description of the blot, and 10 an inability or refusal to formulate anything. These findings, coupled with the clinical observation of a lack of initiative in some of the patients, and a tendency to live in the immediate present and to depend upon the immediate environment for stimulation, suggested that there might be a definite diminution of creative activity after the operation, and prompted us to investigate the matter more thoroughly.

Many trial experiments of different kinds were made, but at the present time we are more or less restricting ourselves to the use of two other tests in addition to the Rorschach. The first of these was introduced after we had experimented with the Thematic Apperception Test where the test is given in two sessions, in each of which the subject is given ten pictures and asked to invent a story about them, introducing what he thought was happening in the situation depicted by the picture, what events had led up to it, and what results would follow from it. We found that it took too long, and also in spite of all instructions people tended to describe the pictures rather than tell stories about them. The following eight sentences, therefore, were devised to use instead of the pictures. The subjects are asked to write eight stories introducing one sentence into each story.

1. I was sunk in the depths of misery ; never had I felt so unhappy as I did at that moment.

2. The joy I felt at that moment is indescribable.

3. All right, I'll tell you about the most terrifying experience I have ever had.

4. There ended one of the most exciting adventures that any human being can ever have experienced.

5. It was the funniest story I have ever heard.

6. You have committed one of the worst crimes that any human being could commit.

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7. It was the loveliest thing that had ever come my way.

8. Night after night I lay awake, eating my heart out with remorse, remembering what I had done.

We stress that it is a test of imagination and make it quite clear that we prefer an imaginary story, but if they cannot do this we will accept something they have seen or read, or a real experience of their own; and we ask them to record at the end whether it is imaginary, remembered or autobiographical.

This test reveals considerable variation among normal subjects, some of whom experience great difficulty in doing it, and we have not yet sufficient comparable material to make any definite and dogmatic statement, but such evidence as we have suggests that on the whole leucotomized patients find it more difficult than normal, and in some cases we have almost been unable to get them to write at all. This inability does not appear to be due to lack of intelligence or education, and may be present in cases showing good social recovery. For example, one patient, who was operated on at Barnwood House for a severely incapacitating hypochrondriasis, is now successfully holding his own as a French master in a Prep. School and working for a Degree, but he found the greatest difficulty in doing this test, and at the end of an hour had produced practically nothing. On the whole such stories as they do write tend to be brief and are either autobiographical or an account of something seen, read or heard.

The following two stories are interesting in that they exhibit this constriction of thought in an extreme degree:

1. " I am no Author or story-writer really, and on being asked to write something ' I was sunk in the depths of misery, never had I felt so unhappy as I did at that moment '."

2. " I have just finished No. 1 and must admit ' The joy I felt at that moment is indescribable '."

The second test is non-verbal but graphic. The complete test takes longer than was originally anticipated and so cannot always be given in its entirety. The following instructions given to the subject explain the nature of the test.

Drawing Test.

1. Write your name and underline it clearly.

2. Write 609 as neatly as you can.

3. Copy the drawing as exactly as possible.

4. Do you think this drawing could be improved in any way? If so, draw it as you would prefer it.

5. Copy the painting as exactly as possible.

6. Do you think the painting could be improved in any way? If so, paint it as you would prefer it.

7. Draw anything you like using six curved lines and twelve straight ones.

8. Choose one of the following: Joy, Anger, Sorrow, Fear—and then draw anything you like which will portray that emotion to you.

When given an entirely free hand and told to draw anything they like, leucotomized patients seem to have difficulty in thinking of anything to draw

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and tend either to a literal reproduction of twelve straight and six curved lines, or else to copying some object in front of them.

When given a painting to copy the leucotomized patient often does better than the normal adult—his perceptive sense seems sharpened—it is, however, when he is asked to paint the picture as he would like it that his originality seems to be limited. He is asked to do a copy in the first place because it is important to have some idea of his technical and motor skill; manifestly these factors must be considered apart from his creative ability—his copy then acts as a control for his original painting.

As a preliminary canter, and to avoid our own bias, our first collection of 10 paired paintings was submitted to an independent arbiter for his assessment. He ranked them in decreasing order of creative ability shown, and it is interesting that the leucotomy paintings in this batch were ranked at the bottom of the group, with the exception of the very last which was the painting of an adolescent hemiplegic girl with an I.Q. of 49.

It seems that the leucotomized patient tends to stick to the same choice of colours, especially the purple; he seldom adds anything to the original picture, and often ignores the background. A sufficient number of these paintings has not yet been collected, so that these deductions are very tentative, but our collection is steadily growing from which more definite conclusions will emerge.

Since there does seem some indication that prefrontal leucotomy does diminish, even if it does not altogether abolish creative activity, we have been led to consider the nature of creative activity and its relation to the total personality.

By creative activity is here meant, that form of activity which results in the actualization or realization of some object or event which only comes into being because the creator, having first conceived it in his imagination, deliberately transforms his idea or vision into fact. The motives of such activity must be, as of course the motives of all activity are, emotional, and as such, associated with judgments of value on the part of the creator. In his imagination he conceives desirable objects or events which, had they a real existence, would satisfy his real needs, but which, while they have only an immaterial existence in his phantasy, tend merely to tantalize and stimulate impelling him to translate his ideas into facts. This, however, he can only do provided he has sufficient technical knowledge and practical ability, and the necessary persistence and sustained effort.

There are, therefore, at least four factors involved in creative activity:

(1) Imagination.
(2) Emotional motives and associated judgments of value.
(3) Technical knowledge and practical ability.
(4) Sustained effort and persistent application.

Is there any reason to suppose that leucotomy produces an alteration in one or more of these factors, which might account for any observed diminution of creative activity. Our own observations and those of others, indicate that there is no gross change in the last two factors. There are now many cases on record of patients who have successfully resumed jobs requiring considerable

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technical knowledge, practical ability and sustained hard work. This leaves, therefore, the possibility of changes in imaginative ability, or in emotional motivation and associated judgments of value. For the present I propose to consider only whether the experimental results we have obtained might be due to a relative lack of imagination in persons who have been subjected to leucotomy.

Here it would seem necessary to define what one means by imagination, but in order to do so it is equally necessary to define what one means by its basic root, viz. image. In order to simplify matters the illustration is here confined to visual imagery and visual perception, but it must be remembered that all forms of sensory perception have corresponding sensory images.

In visual perception the stimulus, provided by free energy in the form of light rays reflected or emitted from some physical entity, detonates as it were the potential energy stored in the receptors of the retina, and initiates a wave of biophysical and biochemical activity in certain nerve-fibres and their neurons in the cerebral cortex ; and this is accompanied by the subjective perception of an object, which appears to be placed at the site whence the light rays, which cause this train of events are reflected or emitted.

In the case of a visual image the subjective experience is again of an object situated in space at the same site as in the perception, and this experience is also accompanied by biophysical and biochemical activity in the corresponding nervous pathways. The subjective experience and the concomitant neurological activity though similar are not normally identical, and the image is distinguishable from the percept. This is important because in the case of the image the free energy or stimulus which is necessary to bring about the requisite biological activity is not provided by light rays emanating from the site at which the imaged object appears to be situated, but is derived from some other source. This is made possible by the tendency of the cerebral cortex, under certain conditions to fuse into one composite whole two originally discrete patterns of neuronal activity initiated by free energy from two different sources, with the result that finally the presentation of only one stimulus evokes activity in the whole configuration. The subjective counterpart of this fusion is the emergence of the image ; the presentation of one stimulus not only evokes the perception corresponding to it, but also the image of that other perceptual experience which formerly accompanied it. (The study of the conditioned reflex has thrown much light upon the conditions which govern the fusion of the two separate stimuli into one organized whole.)

The image is thus a fainter copy of an original percept, and is aroused by events which were associated with it. It is, therefore, the physiological basis of memory and the more accurate the memory the more exactly the image reproduces the original percept. To paraphrase Leibnitz, " There is nothing in the image that was not first in the percept " ; and so long as imagery is used only for the purpose of remembering the objects and events of the imaged world, they correspond to those the Lady of Shalott saw in her mirror, and are but copies of the perceptual world, and their order and their relations are exactly the same as those of that world." (Any reference to illusions and errors is here deliberately omitted.)

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This relationship between the imaged and the perceptual world no longer holds good when we turn from memory to imagination, for here we find objects and events that have no counterpart in the world we perceive, but are purely imaginary and fantastic. Now this originality of the imaginary world is more apparent than real, for on careful investigation it will be seen that the entirely new objects and events which exist in the world of imagination are constructed out of parts which are derived from the world we perceive. Even in imagination there is nothing in the image which was not first in the percept, the only difference is that images of perceived parts are re-organized and re-integrated into new imaginary wholes, but it is only the re-organization which is novel.

Nevertheless I believe it is true to say that this re-organization of images derived from percepts is the essential basis of man's creative activity, and further that it is dependent upon language ; only man has representative language, and there seems good reason to suppose that the proximity of the speech area to that controlling the motor activity of the dominant hand is not purely accidental.

With the introduction of representative language a speaker can by *his own activity* produce the stimulus necessary for the evocation of an image. For example, since normally the physical phenomena responsible for the visual perception of a dog and the auditory perception of its bark fulfil the conditions necessary for fusion the presentation of one stimulus is capable of evoking the image of the percept normally caused by the other. If a man deliberately copies a dog's bark, this sound will serve instead of the animal's bark and will be capable of arousing the image of a dog in the hearer. No longer is man dependent upon immediately given stimuli in his environment to provoke imagery and re-awaken memory, he is able to do this by means of his own activity ; he can do it at will. By means of the representative function of language he can translate his own percepts and images into sounds or gestures whereby he can arouse corresponding images and percepts in others ; his word whether gestural, spoken or written serving as the physical stimulus which arouses the image in the hearer.

This is important from the point of view of memory, but language serves yet another function in imagination, for words may be combined by the speaker in ways in which the natural phenomena which they represent cannot, with the result that the images which they evoke will be of objects and events that have no counterpart in the world which we perceive ; by means of language a world can be imagined in which cats play fiddles, cows jump over the moon, and dishes run away with spoons. Cats, fiddles, cows, the moon, dishes, spoons, playing, running and jumping, all are derived from the world of perception whence they are translated by language into a world of phantasy.

Now although language can construct purely imaginary objects and events, man by no means necessarily uses it this way. None the less the child's development and evident enjoyment of pure phantasy suggests that it does satisfy some emotional need, and is probably essential for the full development of man's genuine creative activity.

The objects and events which man perceives in the world around him have gradually been observed by him to behave in certain ways which he has formu-

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lated as natural laws. The imaginary objects and events which he has constructed by means of his language do not necessarily so behave, but may do so. These latter objects and events are still imaginary in that they exist only in man's imagination, but man may by his re-organization of those parts in the real world whence his images are derived, in conformity with his re-organization of them in his imagination, create new objects and new events in that *real* world which we perceive, objects and events which would never have happened had not man first imagined them and then brought them into being. This is true creative activity and it is dependent upon keen observation and accurate knowledge concerning the nature and behaviour of objects and events in the perceptual world, upon the ability to re-organize these imaginatively into a new and desirable whole, and then by effort and practical ability to translate the imagined concept into reality.

In the case of the leucotomized patient his command of language seems as good as ever, his imagery and memory appear unimpaired, his perception of his environment if anything rather keener than it was before, his knowledge and intelligence and practical ability unaltered and in many cases his diligence and industry show little or no diminution. Is there, however, any reduction of that activity by means of which man constructs out of the world he knows, another and a better world, an ideal world which only exists in imagination, but which, if it did exist in reality, would be a more satisfactory world than the real one in which he lives.

If leucotomized patients do, in fact, cease to exercise this creative activity is it because a section of the prefrontal fibres has destroyed the power to do so, or has it merely in some way dissociated the emotional factors which in normal persons motivate such activity ?

This is the problem on which we are hoping to throw light by our experimental investigations.

The absence of such creative activity might account for some of the behavioural changes that have been noted in these patients, particularly their tendency to live in the present and their freedom from anxiety and the sense of moral obligation. For while the present exists in perception and the past exists in memory, the future exists in man's imagination, being imaginatively constructed by him out of his experience of present and past. And whatever may be one's views about absolute values, it is surely true to say that man's ideals also exist in his imagination, and that moral obligation consists in the necessity to translate the ideal into the real. If, as the result of the operation, these patients are either unable or have no emotional urge to imagine a possible future or an ideal standard of what ought to be, they will naturally be freed from anxiety concerning what might happen and from the sense of guilt and remorse which the ordinary person has when he thinks on " those things he has done which he ought not to have done, and those things he has not done which he ought to have done."

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A CASE STUDY.

By M. BASSETT, Dipl.Soc.Sc.,

Research Department, Barnwood House.

Up to the present the investigations carried out at the Burden Neurological Institute into the effect of leucotomy on the creative personality have been somewhat limited since few of our patients had shown any real evidence of a creative urge prior to the operation, and this has been a very great drawback. The use of story-telling and painting tests seemed to show certain differences between leucotomized patients and normal people which were felt to be due to an absence of creative imagination, but it was impossible to be sure that this difference was the result of the operation, or that these people had in fact ever translated their creative spirit into creative action before they became ill (1). It has been of very great interest, therefore, to watch the effect of the operation on a patient at Barnwood House, who, prior to her illness, gave tangible evidence of this spirit in the shape of poems, prose and other dramatic work.

X— is a young woman, aged 32, a Hungarian by birth; she was brought up very strictly, and has undoubtedly been neurotic and obsessional since adolescence and possibly even earlier. Her first breakdown occurred when she was 16, shortly after she went to live in another mid-European country. As far as can be gathered the cause of the breakdown was attributed to overwork; but there is also evidence to show that parental conflict was also a potent factor. Her father was domineering and puritanical, and strongly disapproved of women taking part in any activities outside the home, and it was very much against his wishes that she studied at high school, or went to ballet classes. She had very little freedom—at the age of 17, for instance, she was not allowed to go to the cinema, unless accompanied by both parents, and it was insisted that she sit between them throughout the performance for fear of molestation! Her mother, on the other hand, tried to restore the balance, and one suspects that she was over-lenient and arranged for the girl to undertake various activities in defiance of father, and often unknown to him. This account of the patient's history is no doubt biased, as it was only possible to obtain information from mother and patient, but undoubtedly much conflict existed, and at the present time the parents are separated.

X— is described by her mother as having been a very shy, highly imaginative child, who never seemed to want a lot of friends. X— herself says that as far back as she can remember she wanted to write books and plays, and that as a child she often composed poetry; she thought her desire to write was partly the wish to do as other members of her family had done, especially her father and cousin. I think it must be emphasized that her urge to write was probably motivated by defiance of, and identification with, her father as well as an urge to express herself in creative work.

Since coming to England in 1938 she has written many poems, some of which have been published and broadcast, and she had already started on a book and a play, when in March, 1947, she finally became so preoccupied with her phobias and obsessions that she was unable to work any more. The following poems are example of her work:

"Du Sprachst Von Deiner Heimat.

"Aus: Blumen fur Zdislaw.

" Du sprachst von deiner Heimat leise
An mich gebettet wie ein Kind
Ich lauschte der und, ernst, der Weise
Die draussen Stohnend sang der Wind.

" Die Nacht hielt sanft die dunkeln Arme
Die duftend sie auf mir gesenkt
Und wie ein Licht trug ich die warme
Rotnelke, die du mir geschenkt."

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"*Weinbergschnecke* (1942)

" Das dünne Haus glanzt wie ein Ohrgehange
Aus hellem Gold. Aus seinem Innern, sacht,
Schraubt sich die Schnecke wie aus einem Schacht
Und streckt sich, gelblich, gänzlich in die Lange.

" Die anmutvollen Fühler, zag entfacht,
Erspähen wie in Staunen das Gedrange,
Der dürren Tannennadeln, deren Menge
Den Waldgrund polstert, tief wie eine Nacht.

" Das Kriechtier gleitet auf dem feinen Holze
Mit Sicherheit und jenem zarten Stolze,
Mit dem ein kleiner Kahn voruberzieht . . .

" Die Sterne, die verstreuten Silberkörner,
Tanzen ihm einen Lichtkranz um die Hörner,
Den es in seiner Augen Spiegel sieht."

It seems certain that before leucotomy she did strive to express herself in creative work, and that she did in some measure achieve recognition that some of her poems were worth while. It could be said, of course, that she was driven by the urge to emulate or outdo her father quite beyond her capacity, and that her mental illness, and finally her willingness to undergo leucotomy, provided a method of escape from this powerful drive. Nevertheless, it must not be forgotten that in spite of her difficulties, and maybe in spite of a limited capacity, she did produce some work of a fairly high standard.

From March, 1947, onwards the patient gradually became more and more preoccupied with her phobias and could not go upstairs, nor go out, nor be alone; and having reached the stage when life had become unbearable both for herself and for those around her, and having made no progress either by psychoanalysis (which she broke off on two occasions) or other treatment, she finally decided to have the operation of prefrontal leucotomy. This was performed on 16 August, 1947; the patient's recovery was uneventful and was accompanied by many of the usual post-operative sequelae; she was slow at first, stayed in her bath until the water became cold, had to be prodded to dress or move, and was incontinent occasionally during the first five weeks; with regard to this latter she first expressed no interest, but later she became conventionally " ashamed of myself "—but she showed no feeling of shame or embarrassment, and appeared to be rather amused about it. She complained of ravenous hunger, and said that at first she was so hungry that she had to rush into the dining room and start eating right away—she could never have enough to eat. After the seventh week she said she was still hungry, but her desire for food was not so compelling, and she hoped she would never feel like that again.

The tests described in the earlier paper (1) were given to this patient after the operation, unfortunately they could not be given pre-operatively, and before setting down the results of these tests I would like to quote Hutton's definition of creative activity.

" I would define creative activity as that form of activity which results in the actualization or realization of some object or event which only comes into being because the creator having first conceived it in his imagination, deliberately transforms his idea or vision into fact. The motives of such activity must be, as of course the motives of all activity are, emotional, and as such, associated with judgments of value on the part of the creator. In his imagination he conceives desirable objects or events, which had they real existence would satisfy his real needs, but which while they have only an immaterial existence in his phantasy, tend merely to tantalize and stimulate, impelling him to translate his ideas into facts. This, however, he can only do provided he has sufficient technical knowledge and practical ability, and the necessary persistence and sustained effort.

" There are therefore at least four factors involved in creative activity:

" (1) Imagination.

" (2) Emotional motives and associated judgments of value.

" (3) Technical knowledge and practical ability.

" (4) Sustained effort and persistent application."

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TEST NO. 1.

Harrower-Erickson Multiple Choice Rorschach.

This graph follows quite closely the type of graph we have come to expect from our leucotomized patients, i.e. a high percentage of 9 and 10 responses indicative of poverty of association and refusal or inability to formulate anything.

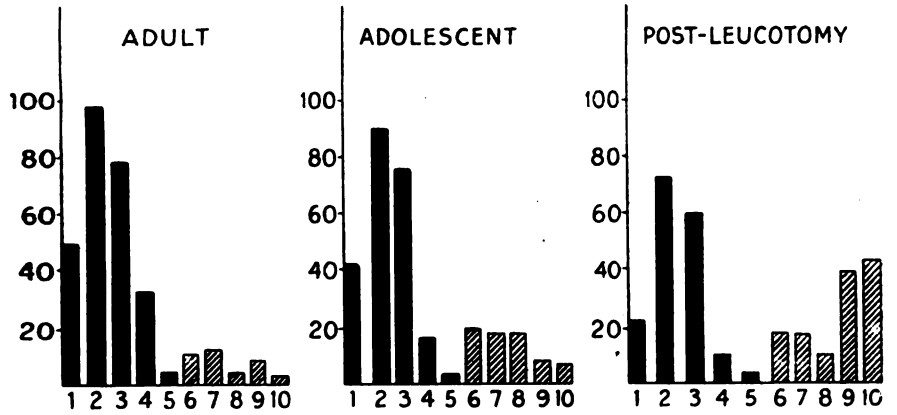

FIG. 1.—Harrower-Erickson Multiple Choice Rorschach. Group results.

TEST NO. 2.

Story Telling.

The patient is strongly urged to " make-up " a story, but the results are extremely limited, especially for one whose profession is a writer—in addition the stories are all " true."

It was also suggested to the patient that she should write around these sentences, using not English, but German, but this she declined to do, saying that language made no difference, and that she would write exactly the same in German.

(1) I was sunk in the depths of misery ; never had I felt so unhappy as I did at that moment.

" When my fiance was killed, I was sunk in the depths of misery ; never had I felt so unhappy as I did at that moment."

(2) The joy I felt at that moment is indescribable.

" When my fiance arrived unexpectedly, the joy I felt at that moment is indescribable."

(3) All right I'll tell you about the most terrifying experience I have ever had.

" All right, I'll tell you about the most terrifying experience I have ever had ; when I was a small child, the restaurant at the ' Black Sea ' caught fire. . . . My mother got terribly frightened . . . and so on . . . ."

(4) There ended one of the most exciting adventures that any human being can ever have experienced.

" There ended one of the most exciting adventures that any human being can ever have experienced ; I saw them *all* fully drunk . . . ."

(5) It was the funniest story I have ever heard.

" It was the funniest story I have ever heard M'selle, you have lovely eyes . . . yes . . . especially your left one . . . ."

(6) You have committed one of the worst crimes that any human being could commit.

" Miss L— you have committed one of the worst crimes that any human being could commit."

(7) It was the loveliest thing that had ever come my way.

" When I first met my (late) fiance . . . it was the loveliest thing that had ever come my way."

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(8) Night after night I lay awake, eating my heart out with remorse remembering what I had done.

"Night after night I lay awake, eating my heart out with remorse remembering what I had done. . . . Alas, I did, and for something which was not even . . . bad."

"It is all true."

FIG. 2.—Drawings utilising 12 straight lines and 6 curved lines. Normal group.

TEST NO. 3.

Line Drawings.

Four weeks after leucotomy the patient was asked to make a drawing, using 12 straight lines and 6 curved lines. She sketched quickly a headless nude without any relation to the number of lines required. This drawing can, of course, be interpreted as a projection of her ideas concerning herself, i.e. her preoccupation with her body and her sense of loss associated with her "head." It is interesting that here she made no attempt to utilize the required number of lines.

Six weeks after leucotomy the patient was asked to do the same test—the results can be seen below, and again they are very typical of the leucotomized patient's efforts. (*a*) In a first attempt she says, while drawing, "I know I am

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eing naughty," which I interpreted as " I could do better if I liked." (*b*) It was hen insisted that she make another effort to combine the lines and curves into a icture, and this resulted in her drawing " mountains and trees "—the lines and urves are scarcely different from (*a*) and there is still no evidence of any ability o integrate the discrete parts.

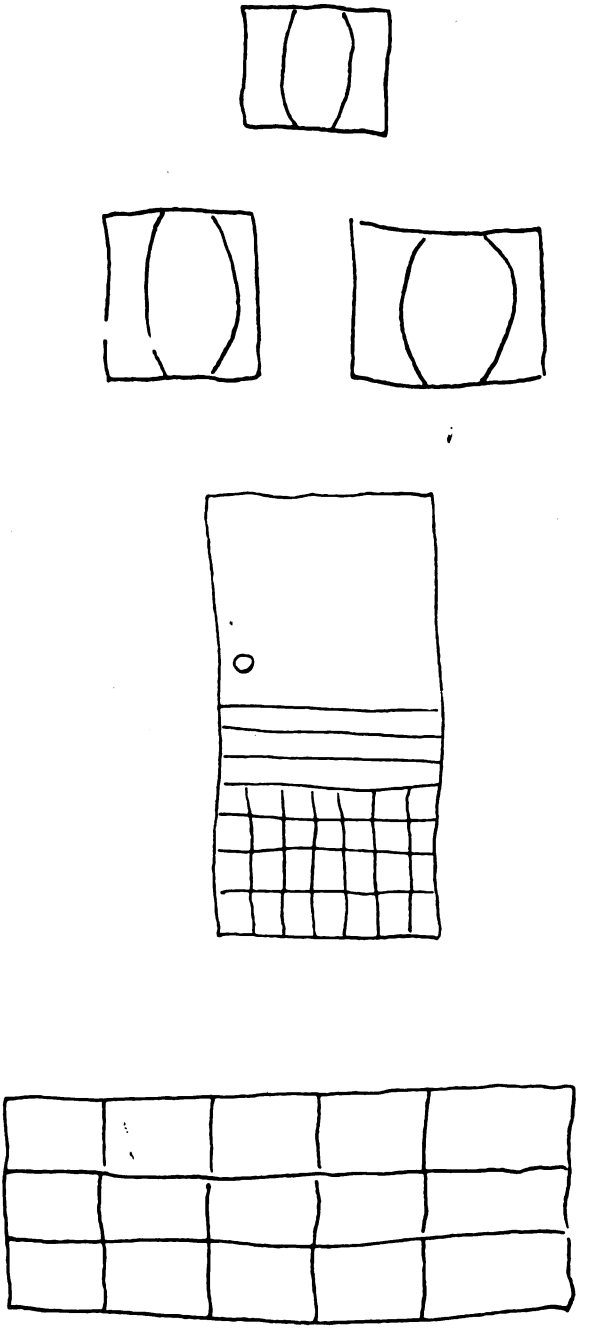

FIG. 3.—Drawings utilising 12 straight lines and 6 curved lines. Post-leucotomy group.

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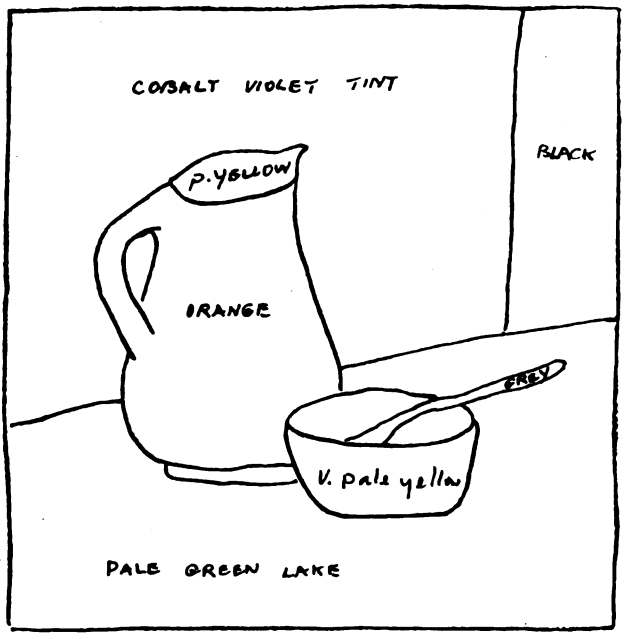

FIG. 4*a*.—Coloured model to be copied as exactly as possible.

FIG. 4*b*.—Blank model for 'improvement.'

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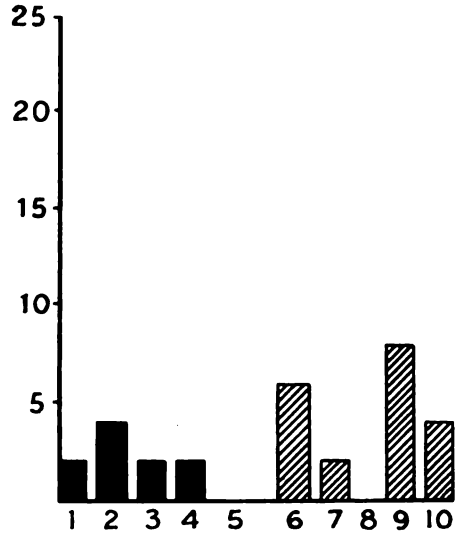

FIG. 5.—Harrower-Erickson Multiple Choice Rorschach. Post-leucotomy. Miss X.

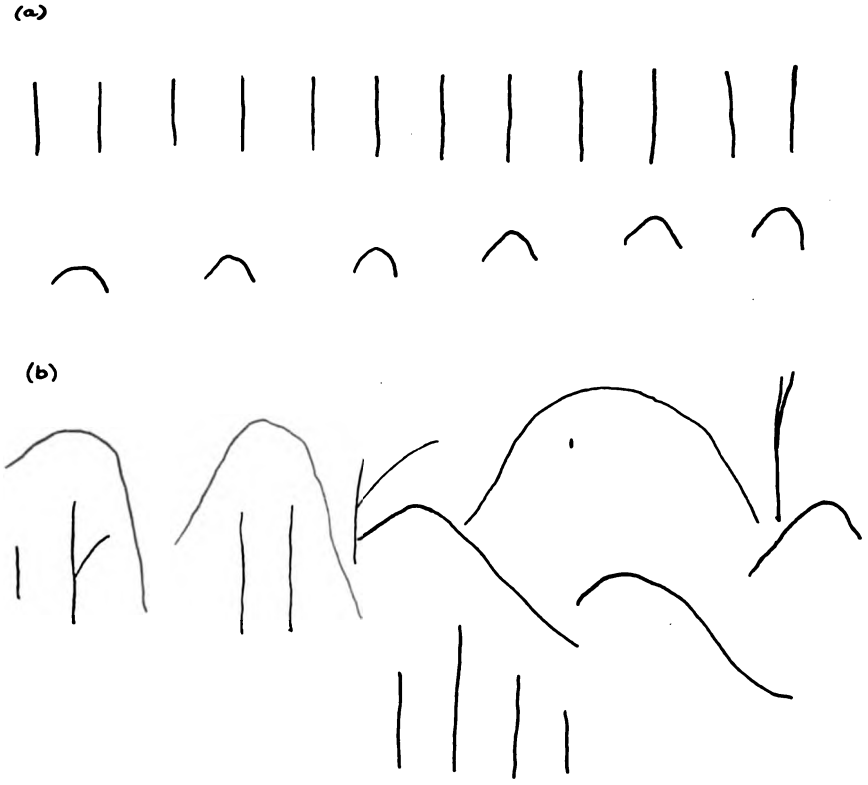

Fig. 6.—Drawings utilising 12 straight lines and 6 curved lines. Post-leucotomy. Miss X.

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Test No. 4.

Drawing and Painting Test.

Four weeks post-leucotomy the patient was given the drawing " Jug and Bowl " to copy—this she did, enlarging the size of her reproduction considerably. Her " Improvement " to this drawing was the addition of some shading and some " stripes " to the curtain. Unlike many of our " leucotomy " paintings, this patient did not copy the painting well—she did not bother to get the exact shade of colour, nor did she trouble much about the application of the paint. Her " improvement " of the painting was again the addition of shading and the stripes to the curtain—otherwise she did not paint the picture but merely outlined the objects in the same colour as the stripes. A few faint marks were put in the background, which she said could be wallpaper, but she made no effort to complete the design.

Up to the present this leucotomy painting differs from most of the other leucotomy paintings which we have collected—there is application of shading and a complete break away from the original colour scheme. Nevertheless her " improvement " of both the drawing and painting is very limited and does not go beyond the addition of shading and striping the curtain. Incidentally she is the first of our leucotomized patients to have studied drawing and painting in adult life—though as she says, she found she was no good at it, and finally gave it up.

In addition to these tests, a full scale Rorschach Test was given on two occasions before the Rorschach Multiple Choice Test. The Rorschach showed much perseveration and limitation of ideas. Several of the Thematic Apperception Test pictures were also given the patient, and again the constriction of thought is very obvious.

It is interesting that in her responses to the Raven Projection Test the patient each time refers either to a film she has seen, a book she has read, or to herself, and to her recent activity of " painting a vase " (Test No. 4). The patient's responses to these tests are printed so that the reader may himself see the constriction of thought, poverty of association and literalness of the material.

The Raven Matrices was given on two occasions, namely 4 and 8 weeks after leucotomy—and the second occasion showed a marked improvement from a score of 29 to a score of 43, which could be considered average.

The Shipley-Hartford scale for mental deterioration showed a Conceptual Quotient of 124, which is well above any pathological level.

Additional Tests.

Rorschach.—Four weeks' after leucotomy.

I. (1) Looks like an inner organ, I don't know—yes that could be the bit of a spine—is it anything ?—better like this—that's all I can say.

II. (1) Oh that—I don't know—rather funny with the red—do they all have red, I don't know—I can't think of anything—yes I think from the beginning that that looks like a woman's organ—a little—and of the red—couldn't be a little bit like menstruation—I don't like the word.

III. (1) Oh, this is rather funny—this ink too, I've got no imagination any more since the operation. Like two people here facing each other—what the red is I don't know—I feel tired already—these look like feet—I didn't use to feel tired—these two people are cut off in the middle—that's all I can say I don't know what these red are—these are 2 men exactly the same I don't like men they are old.

IV. (1) I don't like it I got used to the red now and suddenly all so black—first of all so black, and then I get used to 3 colours.

V. (1) That's not nice either—just a pair of the other thing—I'm afraid that's all I have to say.

VI. (1) Well they all remind me of anatomy, different organs—kidneys, I always say kidneys. I like to eat them—very easy, sexual intercourse—I suppose people think of other things—I don't know what to do with these things.

VII. (1) This is rather funny, not nice, I don't know what it looks like.

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VIII. (1) Gosh, that has rather a lot of colours, rather nice, a pair of animals, and that I don't know, and that I don't know, is it always my imagination that reminds me of sexual things or only me ? they are mice—ugh—what are these animals doing here ?—could be a child—then I turned it this way and it looked like mice.

IX. (1) I wanted to laugh, I don't know why consciously silly stuff I think—but possibly I'm right—I said sexual organs over most of them.

X. (1) Oh that's complicated, are these crabs here, this could be dogs, two animals here, don't know what they are called—if I had seen these things before I could have told you lots of things, perhaps I'm lazy, I don't know, each of them could be likened to an animal—snakes there.

ADDITIONAL TESTS.

Raven Projection.—6 weeks after leucotomy.

The Road.—To Hell—to the Infernal—where I want to go—much more fun there than in Heaven. It's very hot—not burning hot—summer frock heat—a lot of dancing—I'm thinking of a film I saw many years ago—beautiful girls dancing around—things out of Greek mythology (what happens there). You don't need to worry very much (what like about it) the feeling of leisure—I'm tired of being with good people—you can relax—no one is going to tell you to get out of bed—I shall stay in bed for the first few days after getting out of here.

(Dislike about Hell ?) Might be too hot.

(What do about it.) Go and have a cold shower in a beautiful garden on the outside of Hell.

The Box.—First thing I thought of—the bride—my Mother read the story to me some time—there's something terrible about this box—why made—well it was made for things not for brides—winter clothes. Just to puts lots of things in historical things—it never occurred to me that it could irritate the owner—perhaps I am the owner—I think of the bride again—perhaps he couldn't open it—anything might happen—I don't know who the owner is—he wouldn't be irritated by the box.

The Girl.—(What imagine she is doing.) She's painting a vase (patient had done painting test previous week)—I notice her lashes, long lashes (what interested in.) She looks rather the school type—might be a photo of myself looking like that. Her eyes again attract attention—she's very scholastic. (what thinking) How can I get out of my school uniform and be less schoolish (what is her real work) She's sportish I think—I've never been sportish. (patient sits facing a tennis racquet and balls.) She seems the type who likes precise things—unartistic, practical, quick, lively—just the type I am not. (what dislike) I'm afraid I can't think of anything—she likes what she's doing—she's got lovely lashes—she's not artistic. (Who will see her work) her room or class ? if in her room—nobody—or the maid. coming in with her coffee—I've just finished coffee when you came—or the tutor. (what will they think) that she will bother and when she starts will go on till she has finished—will do her best—not like me—she's a good worker. (what will she think) that she tried her best—that it could be better—but she's satisfied—she might really write . . . (what sort of people does she like) sporty people—practical, lively, different from her (what company does she prefer) men's—(what sort of company dislike) dreamy people . . . she looks so practical that I can't take her out of this . . . (what annoys her and makes her angry) contradiction—I don't like it—nobody likes it (in what way) if she does this or that people telling her that she's done too much, or not enough, or something . . . I've had so much of it. (what does she do when angry) then she contradicts even more—she doesn't keep it in as I would—she's not a neurotic—she plays a game, and forgets it. (what frightens her) Nothing—she's not a neurotic—well—a landmine perhaps, (when she gets tired, what worries her) she's not worried—she is lying down and resting. (She sees or hears something funny) an army joke (what sort) silly . . . not daring . . . (what does she enjoy most) games, dancing, ballroom dancing, men (She dreams she gets what she wants)—long sports socks (given a £1,000) I don't know what she would do, she's so different from me . . . or she is what I would like to be . . . a part of me looked like this at 15 . . . it's died out now . . . she'd start a business, sport or needlework, she would

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do something with it . . . I would dream . . . she might be all that I am not (wakes and finds she's been dreaming) This girl doesn't dream, does she? . . . doesn't worry too much about it . . . says, I've dreamt, that's all (Is she satisfied with things as they are) As much as a person like that can be . . . takes things for granted . . . I feel life is terribly senseless (aim) first to finish her girl's game—her real life's aim is to get something useful and to do it well . . . she sets about it quickly and energetically—she will make a good nurse or tutor. (What do you like about the person you have described) her lashes—and she's so determined . . . if she ordered herself to get out of bed she would . . . not like me. I feel so lost and that I shall fall out of bedroom window (patient has lately moved upstairs by herself) (what dislike about her) She's too broad in the back a bit heavy in the chest . . . but rather nice . . . not the type who would ask what sense there was in life . . . deep down I wanted to die after the operation . . . I hoped perhaps it was more serious than it really was . . . I also want a man that I am in love with. . . . I've a nice boy-friend . . . but I'm not in love with him . . . if little things were different, perhaps, for instance, I was a little hurt. . . . he did not like the way I kiss . . . he told me very nicely . . . (what do you think of your description) must repeat . . . she is all that I am not . . . everything opposite to what I am.

So far, then, the material gained from the various tests does show us a great limitation in imaginative thought. What is more interesting, however, is the patient's own spontaneous ideas concerning this aspect of her personality. The following are extracts from her conversation, and these suggest that she feels a sense of loss :

3 weeks after leucotomy	(What about your writing ?) " Later on at present since the operation, I feel I've no imagination, but I am sure it will come back again."
4 weeks after leucotomy during Rorschach test	" I've no imagination any more since the operation—if I had seen these things before I could have told you a lot of things—perhaps I am lazy—I don't know."
	" Is it always my imagination that I see sexual things, or is it only me."
Passing the hall table on which are a pile of letters	" They can't be for me of course, because I'm no longer here (patient had moved to another part of hospital) " I don't get many letters now, at one time I used to have a lot of letters " (Do you write many now ?) " No—and if I do—2 pages, why and I am stuck—but never mind, it will come back—or even if it doesn't it won't matter."
Apropos of the story telling test	" In everything I have to create I have to be left quite free. I must not be forced in any way—at school I often found it difficult to write essays." (What about now—how do you feel about your writing ?) " It might take some time—I might change my style—I think it will come—in my worst times sometimes I used to write some things—it was always a refuge—I turned very much to writing when the boy I loved was killed . . . I shall work more . . . at something heavier—so that I can reach one good piece of work, although Rilke, who is the poet for me, never reached Shakespeare or Goethe. I have lived so much in my work, that if I could write something really good, which I think good, I would think, this is what I have lived for. I feel a little more friendly towards work now—I've felt a little more these days. Why I really thought I wouldn't be able to work is that I connect that
4 weeks after leucotomy	

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	electric feeling with my emotions--and then if I don't get that feeling any more . . . but that is perhaps a stupid idea. . . .
5 weeks after leucotomy . (How do you feel since your operation ?)	" Everything is different—before I had 2 fears—one was the real fear of being alone and going upstairs, and the other the fear of being afraid and making a fool of myself—now I am remembering, the fear rather than feeling it."
After walking through the gardens of the hospital	" I feel pleased that to-day I made the journey alone—though when I passed the gate leading to the open road I felt a little bit strange." (One of her phobias that of throwing herself under a bus.) " But it soon passed and I did not get that ' electric shock '
6 weeks after leucotomy	(What do you mean ?) " The sort of feeling which I used to get starting in my head and going all over my body—now I wonder if I did not experience that ' electric shock ' whether I shall ever feel the same about my creative work—I wonder if something has been lost—I would hate to think so—it would not be worth it—I was told beforehand about a violinist who had the operation and who is now playing better than she ever did—well, I understand that of course, if she is less tense she can let herself go more, but it is not quite the same as composing, which is something which you make up yourself."
9 weeks after leucotomy . Apropos of leisure	" I'm rather better with reading now, but it's my lack of feeling about my work that does worry me occasionally—*when* I remember it."
Apropos of drink . .	" I react quickly to alcohol—I'm afraid of drink—I'm afraid to let myself go—I don't know how I'll be now, but I don't really like it. It's unaesthetic to be drunk."
Apropos of the operation	" Afterwards I took in little details of the window, if flowers or patterns on the eiderdown or screen I would count them—follow the lines—I was quite obsessed by it, but it didn't worry me and I asked myself--what kind of a game are you playing."
Apropos of dreams . 9 weeks after leucotomy	" I had some rather bad nights, and then for two or three nights I kept waking up after dreams—but I didn't get the same feeling."
Apropos of work . .	" I forget sometimes that I work—but now it means nothing to me—very far away as if it meant nothing to me."
Apropos of work . . 9 weeks after leucotomy	" I wonder if a man like Rilke—if he had had an operation like I have—would have gone on writing—or whether the finer emotions would have gone—I don't think the operation of appendix gave me the same feeling—*really—I have* no feelings—I did not realize I was so far away from life then as I do now—as if in a cloud." (Do you feel far away now ?) " I am slowly coming back now. Letters from my boy now. When I read them they left me cold—now, when I read them again, I can't think why they left me cold." (Do you feel more about them now ?) " Well it was more the realization that he had taken the trouble to do it—he is not really a letter writer."
9 weeks after leucotomy .	" I hope I am still going to be an artist—but perhaps if I haven't the wish to do it, it won't be such a loss—it's better that it went since March and not with the operation." (Patient had said before that she felt
9 weeks after leucotomy	something towards her work even in her worst times.) " I would still like to find out what had caused me

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> this relapse in March." (Do you find it difficult to write ?) " I did find it hard to write, and I know it did not come without effort, but even great writers have experienced that—Thomas Mann, the writer, had great difficulty in writing, yet he wrote a lot."

I think it is possible that we may have underestimated the cost of creative work to this personality. Nevertheless, assuming that this is great, no obsession phobia or physical illness prevented her from producing *some* work of a fairly high standard and it remains to be seen whether leucotomy is also an "also ran."

Summary.

Following observations made on previously leucotomized patients who seemed to be lacking in creative ability, a detailed study has been made of a patient who, prior to the operation, had shown real evidence of creativity.

1. The study is so far limited to a period of nine weeks after leucotomy.
2. Evidence so far gathered suggests that :
    1. Creative imagination is much reduced and almost non-existent.
    2. Emotional motives and associated judgments of value are not apparent.
    3. There is some decrease in effort and application.

The salient feature of this study is the patient's intellectual appreciation of these deficiencies.

Conclusion.

Up to the present it would seem that the effect of leucotomy has been to eliminate the " creative spirit " from this personality. It remains to be seen whether this is one of the lasting effects of the operation, or whether it is merely a temporary effacement, and whether in time, a spontaneous resumption of creative activity will take place, and if so, on what level.

Thanks are due to Dr. M. Harrower for permission to use her Expanded Multiple Choice Rorschach Test.

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THE MENTAL HEALTH OF BRITISH TROOPS IN THE FAR EAST.*

By R. F. TREDGOLD, M.D., D.P.M.

REASONS FOR CHOICE OF STUDY.

THE general importance of studying the mental health of British troops in the Far East is obvious enough. It is perhaps less obvious that this importance is unlikely to have diminished with the end of the war; for there are still many troops serving in the Far East, and presumably will be for some time.

Some information of the factors likely to affect them may be obtained by studying soldiers in base areas in wartime. In doing so, it becomes evident that the latter have in any case received less attention than they deserve, even if it were only a question of their immediate influence. Most writers have been concerned first and foremost with soldiers in the front line. This is natural enough, for the soldier's first duty is to fight, and the greatest stress he has to undergo is widely considered to be that of enemy action. The psychological problems in base areas have, therefore, seemed a secondary matter—whether they are those of the general or the private.

But on reflection it may be seen that base areas deserve at least as much study as forward—perhaps more. This is because the more technical war becomes, the greater is the number of men needed behind the lines. Each fighter pilot, each submariner, each tank trooper, needs many men behind him to keep his weapons in his hand. Even the modern infantryman needs several men—in uniform or overalls. It is their failure which may cost him his life or the army defeat. This may occur either directly, by an actual shortage of equipment, or indirectly, by an effect on morale. A drop in the morale of base workers results in strikes, political squabbles, profiteering or immorality; all of these have their repercussions on the soldier at the front. At the least, they distract his attention so that he has to fight looking over his shoulder. At the most they deprive him of confidence in his countrymen—leaders, comrades or family—and thus lower both his war aims and his sense of security. Both of these are cardinal. The health of everyone in the chain of supply, whether soldier or civilian, is thus inextricably bound up with the morale and efficiency of an Army in the field.

Soldiers in base areas overseas obviously constitute a link in the chain. A study of their mental health is, therefore, of direct military value in war; and it may provide information about problems of the peacetime army overseas. Finally, it may contribute to our knowledge of group behaviour, and perhaps even suggest remedies for some social problems.

It is realized that some time must elapse after a war before its lessons in

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medicine can be fully digested. The report of the War Office Enquiry on Shellshock (1922) showed that this was so after 1918; it also showed that there were some dangers in delay—for instance by the spread of the very term shellshock—and that accounts published moderately early were valuable both because they were a basis for discussion, and because memory was fresher. It is, therefore, considered permissible at this time to submit the observations made during the course of 1943–45.

As the First World War provided much information about the effects of one particular stress on the human mind (that is, battle), so it may be that the second will enlarge our knowledge of other stresses—in particular the less spectacular domestic and personal problems of the individual.

Outline of Work.

The original work was planned on the following lines of approach:

(1) A study of examples of the gross failures of mental health. This is, of course, a method always to the hand of the psychiatrist. Those failures are his clinical cases, and the factors which produce them are worth detailed investigation.

(2) A study of examples of minor failures of mental health. These are men who do not report sick, but are nevertheless not in perfect mental health, happiness or efficiency. It is probable that they are far more numerous than the frank breakdowns. They are not always seen by the hospital psychiatrist, but are known to regimental officers, combatant as well as medical.

(3) A study of various factors considered likely to affect the health of troops, and a comparison of different occasions when these factors were present or absent.

The details of the studies undertaken for this purpose were as follows:

(i) A general survey of the numerical incidence of psychiatric cases in British troops in South-East Asia and in Southern Army (India).

(ii) An individual survey of 700 British out-patients in a base area in India. These formed a consecutive series between September, 1943, and February, 1945 (except for the omission of a few whose case-notes were inadequate). Their symptoms and aetiology were studied in detail, and an analysis was made to discover any correlation existing between the types or symptoms, of individual and of stress.

(iii) An individual study of certain other groups of patients, who were apparently under the influence of special circumstances in South-East Asia.

(iv) A general study of the factors affecting the health and morale of troops on duty; this was carried out by informal discussions with numerous officers and men in India and South-East Asia.

By the means of studying the health of large groups of men, and of discussing their problems with experienced officers, I hoped to be able to throw light on the extent to which broad influences (which are difficult to measure in any given case) affect the health of the army as a whole. Lest, however, this information should be thought too general in its nature, the detailed investigation of individual cases was also undertaken to provide confirmation.

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For the sake of convenience, however, the findings of both investigations have been grouped together under certain heads. These are :

A. The incidence.
B. The symptomatology.
C. The factors.

A. The Incidence : General Survey.

The incidence of psychiatric cases among British troops in the Far East may be conveniently surveyed under three heads. These are :

(i) Incidence per strength.
(ii) Ratio to all disabilities.
(iii) Distribution of various syndromes.

(i) *Incidence per Strength.*

The ratio of psychiatric cases per 1,000 strength (i.e. healthy and sick troops) is not possible to give for Southern Army in India, since the average number of British troops in the area in each month is not available with enough accuracy.

The incidence in South-East Asia is obtainable for British troops, and the monthly rates are available for officers and other ranks, separately, showing the number of psychiatric admissions of each per 1,000 total strength, as follows :

Table I.—*Incidence of Psychiatric Admissions in South-East Asia.*

	Officer cases per 1,000 officers.	Other rank cases per 1,000 other ranks.
May, 1945	1·13	2·21
June	1·15	2·30
July	1·94	1·14
August	0·94	1·13
September	1·37	0·93
October	0·45	0·57
November	0·25	0·43
December	1·08	0·79
January, 1946	1·19	1·0

I may call attention to several aspects of these figures :

(i) Among officers there are steep rises in July and September, 1945.

(ii) Among other ranks there is no comparable rise in these months, the peak having been reached in June.

(iii) In October and November, 1945, figures for officers and other ranks fell below the average for the United Kingdom (quoted in para. 3 above). But apart from these two months, the average rate was far higher and exceeded even the rate of Middle East Force.

These figures do not make any distinction between front line and other troops, and it is very difficult to obtain any reliable evidence on these points.

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The number of British troops in any psychiatrist's "territory" was by no means constant, so that it is difficult to obtain reliable figures in this way.

(ii) *Ratio to all Disabilities.*

The ratio of psychiatric cases to all cases is not available either for admissions to hospital or for out-patients in India.

It is, however, possible to give the ratio for cases evacuated from the Far East, for Southern Army in 1944 received all cases for evacuation to England from India and Burma, and the proportions obtained by myself from the Standing Medical Review Board were :

	All cases.	Psychiatric cases.	Percentage.
Officers . . .	1,259	286	22·7%
Other ranks . .	6,771	1,700	25·2%

It will be seen that although this figure is lower than the 40% reached (in the Western theatre) in 1914–18, it nevertheless exceeds the evacuation rate from Europe in 1939–45.

In South-East Asia monthly figures are available which show that the proportion of psychiatric admissions to all admissions ranges from 1·1 per cent. to 4·5 per cent.

(iii) *The Distribution of Various Syndromes.*

This has been studied in several large groups of patients (all British soldiers) :

(*a*) The 700 out-patients seen between September, 1943, and February, 1945, and selected for the detailed analysis later described. The proportions here were psychoneurotics and psychopaths, 78·0 per cent., defectives 14·0 per cent., psychotics 2·9 per cent., and others 5·1 per cent.

(*b*) The total out-patients seen in the whole of Southern Army (India) between 1 January, 1944, and 30 June, 1945. The proportions are psychoneurotics and psychopaths 80·5 per cent., defectives 6·0 per cent., psychotics 3·9 per cent., and others 9·6 per cent.

(*c*) The total in-patients seen in the same area as (*b*) and nearly the same period (1 July, 1944–30 June, 1945). Of these psychotics formed 14·9 per cent.

(*d*) The total out-patients in South-East Asia between April and June. 1946 (figures obtained from colleagues). Of these, psychotics formed 3·9 per cent.

(*e*) The total of in-patients for the same period and area as (*d*). Of these, psychotics formed 38·1 per cent.

(*f*) The total of in-patients for the same area but several months earlier (i.e. November, 1945, to February, 1946) of these psychotics formed 49·2 per cent.

It is unfortunate that the figures for the out-patients corresponding to (*f*) are only available for January and February.

(In groups (*b*)–(*f*) inclusive the figures are partly from my own cases, partly from those of colleagues, whose returns were submitted to me.)

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It must be remembered that some psychotics will by-pass out-patient departments and reach hospital direct, so that out-patient figures will be rather too low. On the other hand, since practically all psychotics are admitted (but by no means all psychoneurotics), the hospital admission rate will be too high, and will in fact only show the ratio of psychoses to the total of *severe* psychiatric disorder. Similarly evacuation rates will show an even higher proportion of psychotics.

Information from this rather random harvest may be more easily gathered if the figures are stated in some order, shown as the proportion of psychosis to total psychiatric cases, and compared with those of para. 5 above. Table II summarizes this :

TABLE II.—*Ratio of Psychosis to Total Psychiatric Cases in Various Theatres (only British Troops).*

Theatre.	Date.	Percentage in out-patients.	Percentage in admissions.
U.K.	1943–'44	2·2–2·9	16·3–26·5
M.E.F.	Oct. '43–Mar. '45	4·9–7·4	19·0–31·3
Various corps and divs. in Burma	Oct. '43–Mar. '45	3·0–6·5	Unknown
Selected out-patients (India)	Oct. '43–Feb. '45	2·9	,,
Southern Army (India)	Jan. '44–July '45	3·9	14·6–19·7
South-East Asia	Nov. '45–Feb. '46	7·25 (Jan. and Feb. only)	49·2
,, ,,	Apr.–Jun. '46	3·9	38·1

From this it can be seen that (i) there is generally a higher rate of psychosis among out-patients of British troops in the East, (ii) that there was a rise among in-patients in the Middle East and, very markedly, in South-East Asia, but not in Southern Army. (It is possible that the last figure, which is lower in proportion than the out-patient figure, may be partly explicable on the grounds that there are more non-psychotics admitted to hospital, since alternative disposal (e.g. the Pioneer Corps) is precluded by the conditions of service).

B. THE SYMPTOMATOLOGY.

(*a*) *Psychoneuroses.*

This is better seen from a more detailed study of a smaller group, and to this end the group of 700 British out-patients (mentioned in paras. 21 and 23) has been analysed in detail (see Table III).

The classification of psychoneurosis used in Table III is not that laid down in the Army nomenclature and needs some explanation.

The four groups were separated on purely descriptive grounds, according to their superficial appearance.

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TABLE III.—*Psychoneurotics in 700 Out-patients.*

	Officers.	Other ranks.	Total.	Percentage officers in total.
(*a*) Free anxiety	60	160	220	27·3%
(*b*) Psychosomatic syndromes	18	222	240	7·5%
(*c*) Depressive features	11	23	34	32·4%
Total psychoneurotic less obsessional	89	405	494	18·2%
(*d*) Obsessional states.	5	9	14	35·6%
Total all cases	113	587	700	16·1%

Thus Group (*a*) covered those cases where anxiety occurred without complaint of physical disability.

Group (*b*), psychosomatic syndromes, contained cases whose presenting symptom was a physical complaint. This group was split up again on descriptive grounds into seven sub-groups, named after the site of their complaints, as follows:

(i) Head: Reserved for those in whom headache was the main complaint (except anxiety states as mentioned above). It was found that dizziness was often associated with headaches, and sometimes with complaints of eye-strain or photophobia.

(ii) Chest: Consisting of precordial pain and dyspnoea on exertion, palpitations and tachycardia.

(iii) Alimentary tract: Including epigastric pain, flatulence, diarrhoea, anorexia.

(iv) Back and neck: Complaints of fibrositis, lumbago, rheumatism (without adequate organic cause), and muscular stiffness or pain.

(v) Legs: Complaints of sensory or motor trouble, which interfered with locomotion.

(vi) Genito-urinary system: Including frequency, enuresis and pain.

(vii) The remainder were a heterogeneous collection, including deafness, blindness, stammer (of which incidentally there were only six cases), and fits.

It will be observed that no distinction here has been made between hysteria and visceral neurosis. This omission has been deliberate, since it is hoped first to present a clear picture of the presenting symptoms, and only later to discuss the underlying psychopathology, and consider which of these two terms was more appropriate for each particular case. It will be seen that groups (*a*) and (*b*) correspond practically to Ewalt's definition of simple anxiety (see below) and pyschoneurosis respectively; his third group contained cases with structural alteration. Now it is in fact difficult to decide whether or not any given case has a structural alteration, so that it is considered better, in a descriptive classification, not to separate such a group, but to include cases with possible structural change in Group (*a*) or (*b*) (whichever is appropriate to their presenting symptoms).

Group (*c*), psychoneuroses with depressive features, is again a descriptive label for those cases in whom the presenting symptom was depression rather than anxiety, and in whom there was no physical complaint.

Group (*d*), obsessional states, consisted mainly of long-standing cases whose precise aetiology was difficult to determine at an out-patient interview. For this reason, and because of their relatively small number, they have not been included in the analysis of factors which follows.

The psychoses have been described elsewhere (Tredgold, 1947).

C. ANALYSIS OF FACTORS.

The responsibility of the various factors is studied in several groups, the main one being the 700 out-patients mentioned. The 494 psychoneurotics in this group have been investigated in detail, and a summary of the findings is

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shown in tabular form in an Appendix. For convenience, however, certain salient points have been withdrawn from this table, and are shown more simply in the main text. Material from other smaller groups has also been added where necessary to illustrate some particular point. Information obtained from my own observations in discussing these factors has been put in the shape of a commentary where it is relevant.

The various factors concerned were grouped in the literature under the heads of (i) Constitutional, and (ii) Environmental. This will also be followed here.

(i) *Constitutional Factors.*

These may be considered first in regard (*a*) to the psychoneuroses, later (*b*) to the psychoses, and (*c*) in general.

(a) *Psychoneuroses.*

An assessment has been made of each of the 494 cases, who have been shown as one of four types: (i) the dullards, men known to be in Selection Grade 5 (on the progressive matrices test); (ii) men with any psychosomatic trait, labelled here the " neurotic "; (iii) the normal; and (iv) the excellent, reported to have been outstandingly good at their work.

TABLE IV.—*The Relation of Previous Personality to Symptoms.*

Symptom.	Total cases.	Dull.	Previous neurotic.	Personality normal.	Excellent.
Psychosomatic:					
Head	78	13	13	45	7
Chest	35	5	9	18	3
Alimentary	40	8	11	17	4
Back and neck	24	1	4	17	2
Legs	15	2	2	11	—
Genito-urinary	17	5	6	5	1
Others	31	6	9	12	4
Total psychosomatic	240	40	54	125	21
Free anxiety	220	22	53	118	27
Depressive	34	4	4	24	2
Total	494	66	111	267	50
Percentages	100	13·3	22·5	54·1	10·1

It will be seen that—

(i) Over 50 per cent. of each group, except genito-urinary, were without evidence of previous instability.

(ii) Dullards were commoner among the psychosomatic syndromes.

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(b) *Psychoses.*

A survey has been made of constitutional factors in several groups of psychosis totalling in all 142 seen during this period.

(i) A group of 60 officers evacuated during 1944 from Burma and India. This forms part of a survey of 150 psychiatric officer casualties already referred to and published elsewhere (Tredgold, Heffernan, Kelly and Leigh, 1946).

(ii) A group of 59 cases evacuated from South-East Asia by hospital ship (H.M.H.S. "Atlantis") in March, 1946; they had become ill between August, 1945, and January, 1946.

(iii) A group of 23 manic states described elsewhere (Tredgold, 1947).

The presence of constitutional factors has been assessed as in Table IV above, that is as "dull," "neurotic" and "normal." There does not seem to be adequate evidence to grade any as excellent. The three groups are summarized in Table V, to show the high proportion of previously normal individuals.

TABLE V.—*Constitutional Factors in Psychotics.*

Group.	Total.	Dull.	"Neurotic."	Normal.
(i) Officers in India and Burma	60	—	8	52
(ii) Hospital ship in S.E. Asia	59	9	16	34
(iii) Manic states in S.E. Asia	23	—	2	21·3
Total	142	9	26	107

(c) *General.*

The effect of previous personality on prognosis can be shown by an analysis of the rates of evacuation to England (i.e. as unfit) of the several types.

TABLE VI.—*The Influence of Previous Personality on Prognosis.*

	All cases.	Dullards.	Neurotic.	Normal.
Total cases	494	66	111	317
Cases evacuated	185	39	26	120
Percentage evacuated	37·0	58·5	23·4	37·8

It is noteworthy that a greater proportion of normal than of neurotic had to be evacuated, but that dullards had a worse prognosis than either.

If both psychoneuroses and psychoses are considered together it may be seen that the evidence of previous instability is of very little significance. This is in line with writers quoted who refuse to place much reliance on "psychoneurotic traits." The evidence here is that previously normal and even excellent soldiers provide the bulk of psychoneurotics and psychotics among British troops in the Far East.

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Dullness, however, is of more importance, and it is justifiable to say that the dullard's chance of developing psychoneurosis is above normal. Whether a dullard is also prone to psychosis is hard to say, and the results here are inadequate to allow of an opinion; for the cases available to study, being largely officers, do not provide a fair sample in this connection.

(ii) *Environmental Factors.*

General.

These were grouped as enemy action, domestic affairs, physical health, employment, war aims and faith, and group relations. Of these six, the first four include adverse factors whose presence can be later detected with comparative ease; the last two produce an adverse effect by lack of positive qualities which are more difficult to estimate. It has, therefore, not been thought practicable to demonstrate them numerically, and attention has been concentrated instead on the first four. First, their presence in the group of 494 psychoneurotics is plotted in Table VII against the presenting symptoms.

TABLE VII.—*The Relation of Environmental Factors to Symptoms.*

Symptom.	Number of cases.	Factors.					
		Several together.	Enemy.	Domestic.	Physical.	Work.	*Nil* traced.
Psychosomatics—							
Head . .	78	9	13	16	32	23	3
Chest . .	35	6*	8	8	18	6	3
Alimentary .	40	7	7	11	16	10	3
Back and neck	24	2	2	2	18	4	—
Legs . .	15	2	1	2	11	3	—
Genito-urinary	17	4	3	3	7	4	4
Others . .	31*	4*	3	7	15	8	4
Total psychosomatics	240	34*	37	49	117	58	17
Free anxiety .	220	41*	49	71	69	69	11
Depressions .	34	10*	6	23	7	9	—
	494	85*	92	143	193	136	28

* In several cases there were more than two factors operating, so a discrepancy in the totals will be evident.

The salient features are that—

(i) Physical factors were found in nearly 50 per cent. of all psychosomatic syndromes, and in 39 per cent. of the total. They were particularly high in back, neck and leg complaints.

(ii) Domestic stress and unsatisfactory work were next most important, the former especially so in the depressions.

It may also be of interest to investigate how these several factors were

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distributed among officers and other ranks respectively. This has been worked out and is shown in Table VIII.

TABLE VIII.—*The Factors Operative among Officers and Other Ranks.*

Factor.	Officers.	Other ranks.	Percentage officers of total.
Enemy	6	86	9·8%
Domestic	17	126	11·9%
Physical	27	166	14·0%
Employment	39	97	28·7%
Total	89	405	18·0%

The normal ratio of officers to other ranks is approximately 1 : 20, so that the ratio here of roughly 1 : 4½ indicates a high officer casualty rate.

The higher proportion of officers affected by employment is clearly seen.

Next, the environmental factors may be considered *seriatim*.

(a) *Enemy Action.*

This is important as an aetiological factor in base areas in so far as it produces either a predisposition or a progressive condition, later to become fully fledged. Naturally there were many soldiers in any base area who had seen action elsewhere, and this number included men who had been through the campaigns in France (1940), Madagascar, N. Africa and Burma (1942–43).

It was therefore not surprising to find a number of patients in whom battle stress was of importance. The stresses concerned were various; but the majority consisted of some particular episode, such as being cut off on patrol, or seeing a friend blown to pieces at their side. None had been treated at the time. In many, repressed material was present and could be removed.

It would be interesting to estimate how many men had been through battle undamaged, only to be later overwhelmed by another form of stress. No reliable figures are available on this point, but it can be seen that only 92 of the 494 cases were regarded as having been affected adversely by battle (Table VII), which is probably less than the total exposed. If this is so, it is a tribute to the success of "battle inoculation" practised during training. It may, moreover, be noted here that enemy action was responsible relatively less often among officers (Table VIII), and that its effects responded more easily to treatment (below, Table XII) than did domestic and physical stress.

(b) *Domestic Affairs.*

In this survey domestic stresses have been divided into three groups:

(i) Proved infidelity of wife; that is, definite cases, and not those which were merely suspect.

(ii) Separation: This group was restricted to cases whose complaint was simply that of persistent homesickness, without added domestic difficulty.

(iii) Other stress: The remainder included real or imagined illness of relatives, estrangement, financial or business troubles and bereavement.

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The severity of these types of domestic stress can be seen from Table XIII. Their detailed effects need further study.

Naturally, some are inevitable, and none are directly under the control of the military authorities. But their effect on the soldier is by no means inevitable or unalterable; indeed in many cases their effect depends less on the nature of the original cause than on the attitude of the soldier's superiors and on the existing regulations. These are, therefore, important both in themselves, and in the impression they produce.

It was unfortunate that many soldiers had the impression that victims of domestic trouble would not receive much consideration. In the peacetime army the part played by the regular officer in looking after this side of his men's welfare was excellent; in war there are obvious difficulties (new officers, and a strain on administration), and there is more stress. But it was not the occasional errors which roused the soldier's resentment, but behaviour which implied a totally unsympathetic attitude.

(i) The subject of infidelity is a very clear example of the difficulties of both sides. It was common enough for most men to be acquainted with an example; there was a most fertile soil for rumour; the presence of foreign troops in England and the length of absence from home exaggerated the tension. Therefore there were many soldiers prepared to expect the worst (more than those who will now admit it), and many ready to believe it on the most inadequate grounds, such as delay in mail. Moreover, they were convinced that if the worst did occur, they would have little chance of a reconciliation by returning home. A victim's first impulse was to get home, but compassionate repatriation was not in his unit's power, but needed application to a tribunal. It was, moreover, subject to so many conditions and to such delay (at any rate till 1945) that it became an added irritation instead of a solace. As a result many developed severe psychiatric disorder, and had to be returned home on this account, but after the loss of much time, of much health and much of their comrades' confidence in the authorities.

On the other hand, the view was held that to introduce compassionate repatriation for infidelity would be to put a premium on immorality; the bad wife would get her husband home, the good would not. In fact, few soldiers (and perhaps fewer wives) had thought of the matter in this way at all; there would be pity, not envy, for a comrade going home to an unfaithful wife. It must also be recorded that it was by no means the irresponsible man whose wife betrayed him; good fighting troops, "the backbone of the nation," were equally affected (this was testified in a report by the C.O. and padres of a division quoted by Mathers (1944), who called attention to the alarming rise, mostly among men over 18 months' service overseas, which was then coupled with an expectation of two or three more years to come).

As to why this period of absence is important, there are obvious reasons: the soldier is bound to be losing touch with the interests of those at home; their worlds have spun apart; and only the best correspondents will have been able to portray their daily existence so vividly that it is still alive 6,000 miles away. This has happened most acutely between husband and wife, where other difficulties also may develop. The loneliness of either may lead them to

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seek comradeship which culminates in genuine attachment or sexual promiscuity, with its guilt to follow. Stories current at home of the irresponsibility of their husbands overseas, and in the Army of the immorality of their wives at home, may be often an incentive or an excuse for yielding to any temptation offered—" what is sauce for the gander, is sauce for the goose."

Infidelity has been taken as an example because it presented a clear picture of the conflicting attitudes ; but other domestic stresses, such as bereavement, produced comparable results.

(ii) Homesickness or separation anxiety is a different problem, and in regard to this it is important to consider the emotions of the new arrival. It is singularly unfortunate that he is exposed at once to two further forms of stress. The first is the impression of not being wanted, produced by the interminable delay and boredom of transit camps, the casual remark, " But your trade isn't used here," and the general neglect. It is indeed the stone of neglect rather than the bread of affection given to a very hungry child. The combined effect of these factors is of the utmost importance. All ranks and all services have described it most bitterly, and perhaps the specialist branches most of all. The latter had been compensating for their homesickness by reassuring themselves that they were essential in their new work, and their disappointment was the greater. On a few occasions drafts have been welcomed at the port of arrival, and a full description of the conditions of life, the type of work, and the nature of the country has been given. The warm appreciation received has been witness to the need for increasing the scope of this welcome. The wastage which results from delays in posting and in travelling has only just been realized. Comments from embittered doctors have appeared in the medical journals, and now a report has been published by the Directorate of Research. But the assessment made is only one of hours or man-hours wasted ; it takes no account of the drop in efficiency of the men per hour, nor of subsequent damage to their will to serve.

The second stress which meets the new arrival is another kind of disappointment. He has consoled himself on his voyage out by the hope that there will at any rate be a letter waiting for him at his port of arrival—that is, there will be contact with home. Sometimes there is, but by no means always. No doubt there have been, and will be, very real difficulties of security and transport in the way ; but the price to pay for their existence is high. The soldier is in a most suggestible mood, and the colour of his feelings on landing may determine his whole attitude to the country for ever. This is, of course, even more necessary when the soldier arrives in a spirit of resentment from real or imagined injustice in drafting.

Length of Service.

The effect of length of service, both overseas and total, would be of interest. To obtain any figures of value, however, it would be necessary to know the overall distribution of the various service groups, month by month, throughout the army. This has not been available from any statistical source ; and I can do no more than call attention to a few points. It did not appear from a study of the figures that the *total* length of service had much effect on psychiatric breakdown, but some indication of the importance of overseas service can be given by the following consideration.

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A study of 100 sufferers from venereal disease was made in the same area by several colleagues and myself. From this, it was evident that the average time for these men to contract this disease was 19 months after leaving home; that in the great majority the disease was obtained at their first intercourse in the east; and that many admitted they had sought the latter because they were suffering from homesickness or the news of some domestic calamity. The number of the "chronic promiscuous" was relatively small.

(c) *Physical Causes.*

The exact types of physical causes discovered in the 193 cases are shown in Table IX, being plotted against the presenting symptoms.

TABLE IX.—*The Relation of Types of Illness to Symptoms.*

Symptoms.	Total.	Malaria.	Amoebic dysentery.	Other alimentary.	Minor Ops.	Injury or disease of				
						Back and neck.	Legs.	Chest.	Head.	Other.
Head	32	5	2	—	2	—	—	2	6	15
Chest	18	4	3	—	1	—	1	7	—	2
Alimentary	16	—	4	10	1	—	—	—	—	1
Back and neck	18	2	—	—	1	14	—	—	—	1
Legs	11	—	—	—	—	—	11	—	—	—
Genito-urinary	7	3	—	—	2	—	—	—	—	2
Others	15	2	—	—	3	—	—	—	—	10
Anxiety	69	10	8	6	2	—	1	2	6	34
Depression	7	2	2	—	1	—	—	—	—	2
Total	193	28	19	16	13	14	13	11	12	67

There is here a clear relation between the type of physical factor and the psychosomatic symptoms produced. Thus of 16 with alimentary complaints, four had had amoebic dysentery and 10 some milder ailment. Of the 18 chest complaints, 7 had some organic chest lesion as a basis; while the physical factor in the back, neck and leg disabilities was even more marked.

There is still considerable disagreement about the relative importance of physical and psychological factors in many syndromes. It may, therefore, be of some value to study in more detail the ways in which the two were associated here. It was evident that this occurred on particular occasions:

(i) Shortly after disembarkation.
(ii) After evacuation from battle.
(iii) On exaggeration of a minor ailment from fear.
(iv) From resentment at unfairness.
(v) After prolonged or repeated severe illness.
(vi) After over-exertion.
(vii) As an immediate escape from stress.
(viii) On convalescence.

(i) *After disembarkation.*—Minor gastro-intestinal complaints are prevalent on arrival in the east, as are certain failures of physiological adaptation, such as lassitude or headache. It is not difficult to see how functional symptoms can be grafted on to either, for there is generally some degree of homesickness and frustration, and there is dislike or fear of the tropics and their indigenous fauna (reptilian, microbic or human). There are also preconceived ideas, whose inaccuracy is only equalled by their persistence, concerning the risks of cholera or of sunstroke. Thus the sufferer from diarrhoea or lassitude will

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become convinced that he is unduly sensitive to the climate, and once his attention is focused on his symptoms they naturally persist. This reinforced his conviction, and his introspection, so that he is wellnigh incurable by either physician or psychiatrist—whose collaboration at an earlier stage might have been successful. Similarly headaches or early fatigue persist, though in a less dramatic way; attempts to evade the issue by allowing the patient to go to a hill station merely give him the chance of developing mountain sickness.

(ii) *After battle.*—There are several occasions when an individual's normal suggestibility is increased. One of these is after passing through severe emotional strain such as battle; a casualty, therefore, evacuated from the front line may be a candidate for a functional exaggeration; and the excellent system of speedy evacuation made this easy for many to develop; in fact, it caught in its net many already on the road to recovery. Unfortunately once they were posted in the evacuation pillar-box in Burma there was often no delivery till they reached a base hospital in India. Naturally doctors at staging posts on the way could not be expected to make a precise evaluation of the functional and organic components in each case, so that hysterical overlays were accepted (by doctor and patient) as organic. Once at the base, symptoms tended to remain as an obvious excuse for the soldier's presence there, and as a basis for a pension claim. Moreover, either wound or illness, but more especially the latter, might reactivate old fears of permanent damage to health.

(iii) *Exaggeration of a minor ailment.*—The individual's suggestibility again is heightened when he is in the presence of a doctor or nurse, whose lightest word is taken as gospel—a point too seldom realized by the modest doctor. "Careless talk" thus produces illness. No doubt patients who imagine some chance phrase to mean the worst are very ignorant, or very stupid; but the doctor is in a position to recognize either, and should behave accordingly.

(iv) *Resentment at unfairness.*—An entirely different type of mistake is made by the doctor who implies, and occasionally states, that the patient with a minor complaint is malingering. Not unnaturally, the latter's symptoms increase; indeed, they could hardly do otherwise, for any improvement would be such a tacit admission of guilt as few would be strong enough to make. On the other hand, simple examination and reassurance could do much. It is the writer's opinion that while frank malingering was very rare, the exaggeration of ailments in this way, part conscious and part unconscious, was always alarmingly large.

(v) *Over-exertion.*—Over-exertion was a common precipitating factor, often in the form of unaccustomed physical strain, in untrained individuals, or groups whose job was suddenly changed. Long hours servicing aircraft in the sun and glare no doubt accounted for the high incidence of headaches and dizziness in the R.A.F. (Table XI). Excessive salt loss in sweating certainly was responsible for much malaise, and some headaches. Increasing salt intake, if early, prevented this becoming established. Psychotic symptoms may also follow extreme physical and mental strain.

(vi) *Prolonged or repeated severe illness.*—Repeated attacks of malaria and dysentery often resulted in a general lowering of resistance, and so to ready breakdown under stress. It is significant that this commonly took the form

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of anxiety or depressive states and that the prognosis was poor (Tables IX and XIII).

(vii) *An escape from stress.*—This is the classical hysterical mechanism, and certainly occurs to avoid battle, service overseas, work or responsibility. But it is suggested here that it is less frequent than is commonly supposed; and though gross hysterical reactions of this kind were seen often in Indian and African troops, they were comparatively rare among the British cases of this survey.

(viii) *On convalescence.*—Patients are often sent from medical or surgical wards, or from convalescent depots, with a complaint that previous symptoms have returned or sometimes with a typical anxiety state. These men respond to simple measures of reassurance, or to efforts directed at their morale; but without such simple measures may become intractable.

The explanation of this is probably that soldiers find it hard to resume their responsibilities; their physical powers recover faster than their mental. It was noteworthy that such men were most anxious to rejoin their unit—and it may well be that their most serious loss was that of their group morale.

Turning from the occasion to the type of patient, it may be seen that officers showed less effect from physical factors than other ranks (Table VIII), though there is no reason to suppose they were less exposed than the latter. It is perhaps reasonable to conclude that where there was greater understanding of the nature of the disease, there was less psychological exaggeration.

The importance of the attitude of doctor to patient has been stressed in this study. Taking case histories, I have been struck again and again by the emphasis the patient laid on this. It can be understood that many feel an urgent desire to get their resentment off their chests to some sympathetic listener, and then perhaps to make a fresh start. But instead of an opportunity for so doing, there is too often yet more repression, and impatience, and before long a chronic antagonism to all authority, and particularly to the army, is produced.

This is particularly true of psychotics. It is so consistent that one wonders how many would have been classed as psychotic if their feelings had been allowed free play in a long interview at once. Unfortunately, the people they meet first are generally concerned with bigger problems than the individual and have no inclination to cope with an admittedly difficult case. Impatience produces counter aggression from the patient, and this insubordination is suppressed, often by force. The aggression of hypomanics could mostly be traced to this source, though they were certainly over-active before; nearly all became co-operative and friendly in the face of sympathy. For the same reason, the use of civil mental hospitals, known to be such, is to be deprecated for service men overseas. The mental shock at being " taken for a lunatic " is a severe one, and may deal an incurable wound to the personality. Early kindness and listening will obviate much sedation and shock therapy later.

(d) *Employment.*

It will be recalled from Table VIII that employment was held responsible in a higher proportion of officers than of other ranks. This may be considered with the observation made from Table III that officers provided 27·3 per cent.

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of the free anxiety states, 32·4 per cent. of the depressives, but only 7·5 per cent. of the psychosomatic. To throw more light on this, two further subdivisions of the officers have been made: Firstly, all have been grouped by their branches of the service; and secondly, those with bad employment have been divided into (*a*) frustration and (*b*) inadequacy, according as to which of these two sensations was produced. The results are shown in Table X.

TABLE X.—*Officer Casualties: Distribution of Various Factors among Branches of Service.*

Factor.	Infantry.	Artillery.	R.A.C.	R.A.M.C.	R.E.	Other branches.	R.A.F.	Total.
Enemy action	3	—	—	—	1	2	—	6
Domestic stress	1	2	1	2	2	2	7	17
Physical	6	3	1	3	1	2	11	27
Frustration	1	3	1	2	1	2	2	12
Inadequacy	2	3	—	1	3	13	5	27
Total	13	11	3	8	8	21	25	89

In parenthesis it may be observed that if the 18 officers with psychosomatic syndromes were subtracted from this Table they would not alter its overall appearance, for they were evenly distributed.

The greatest problem appears to be that of inadequacy, which was spread over the services rather than over the fighting units; it can also be seen that domestic and physical factors were more prevalent in the R.A.F. than elsewhere.

The losses due to inadequacy in officers were more disastrous than the losses of other ranks. The combatant arms were less affected than the services. One reason for this is no doubt that the choice of new officers is a wider one, and that they tend to attract a more stable individual. Also throw-outs from the arms may gravitate to the services. But these reasons do not by any means explain the whole position.

Examination of the cases concerned in the survey from India shows that there were some officers who could be regarded as constitutionally inadequate; it is safe to say that none of these would have passed one of the modern Selection Boards, but such cases were relatively few. The majority were officers who had been perfectly adequate in some capacity, but were simply not equal to their allotted works. The reasons for this were varied. Some were sent back too soon after illness and were physically not fit to take over their responsibilities. Others seemed to suffer more from a temperamental inability to deal with some particular aspect of their position. This is difficult to define, and may give rise to question; but records showed that they had in fact done reasonably well (sometimes excellently well) elsewhere, and that it was only when they met some especial obstruction that they gave in. The possession of aptitude for various occupations is now generally accepted, and it seems not unreasonable to postulate the existence of an opposite "pet aversion"—though it is realized that this term or this attitude often covers underlying complexes or even character defects to which attention has already been drawn.

Frustration was also marked in officers doing staff work. A separate study has been made of a group of 150 officers with severe psychiatric disorder (who

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were in fact mostly members of this same series of out-patients) by three colleagues and myself (Tredgold, Kelly, Heffernan, and Leigh, 1946), and this has discussed the types of syndrome resulting. These were as those described in the literature, namely two main types. The first, the restless and over-anxious, and second the depressed. Of these the first was commoner. This type was also described in the account of manic states, with which there is some similarity.

Where these men could be given different employment they improved—the difficulty was to provide it. In India inter-unit transfers were difficult, so that frustration at the delay often supervened; and the prognosis was bad till local arrangements made with the military secretary's branch prevented evacuation.

The number of inadequate other ranks must seem at first sight a disturbing reflection on the efficiency of the much-heralded selection procedure of the Army. There are, however, some extenuating circumstances. In the first place, some of these men had been enlisted before there was any General Service Corps in Britain; many more had arrived in the East before this procedure was in full operation, and so had not been affected by it. Finally, even if selection can be arranged for overseas drafts, there are obvious difficulties, from the viewpoints both of morale and of administration, which interfere with its smoothness.

The Far East at this time, too, had by no means the highest priority, for material or for men, and there was an acute man-power shortage. All these points must be borne in mind by any critic. Nevertheless, there were in the East very few jobs which could be done by the man thrown out of a combatant unit, so that the disposal of misfits was an even more wasteful process than at home. The Pioneer Corps, as known in Britain, did not exist.

An investigation was also made of the type of work and branch of service of other ranks. These were plotted against the types of presenting symptom for the whole group of psychoneurotics; but no significant finding emerged from this, except that (i) the infantry predominated in other rank army casualties (47·7 per cent.), whereas, it will be remembered, only 20·3 per cent. of army officers came from the infantry, and (ii) the proportions of R.A.F. officers to Army officers was approximately 1 : 2½, but of R.A.F. other ranks to army other ranks was 1 : 10.

The Prognosis Associated with Environmental Factors.

It may also be valuable to look at these cases from another angle, which may contribute to the knowledge of the action and importance of environmental factors.

This is the study of the prognosis.

The various influences that may affect it are:

(i) The environmental factors themselves.
(ii) The symptoms.
(iii) The branch of service and rank.
(iv) The length of service.
(v) Constitutional factors: these have already been discussed above.

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(i) *The Several Environmental Factors.*

The effect of various factors can be seen from Table XI :

TABLE XI.—*Evacuation Rates from Various Factors.*

Factor.	Total cases.	Percentage evacuated.
Enemy action	92	34·8
Domestic stress :		
Infidelity	25	88·0
Separation	72	46·0
Others	46	50·0
Physical	193	36·7
Employment :		
Frustration	36	16·7
Inadequacy	100	33·0
No factor traced	38	42·9
Total	592	39·3
Several present	85	47·0

The total number of factors is, of course, greater than the 494 cases, for in 85 of the latter, two (or more than two) operated. In fact when this occurred the prognosis was worse. Secondly, of the individual factors, that with the worst prognosis was domestic stress ; in particular infidelity of wife was so severe that only three of the latter were not evacuated, and two of those had had an application for compassionate repatriation already under consideration when last seen.

(ii) *The Symptoms Themselves.*

These may be expected to exert some influence on the prognosis, inasmuch as circumstances may hinder the recovery of some more than of others. For instance, orthopaedic symptoms will be open to attack by orthopaedic measures, which are not incompatible with carrying on at duty, whereas gastric symptoms, if they are to be met by a diet, will entail hospitalization or at least light duty for some period, and will interfere so much with the soldier's efficiency that he comes to be regarded as an invalid by his friends, and so all the more by himself. Their effects are shown in Table XII.

There is little difference between psychosomatic syndromes and anxiety in prognostic value. Depression, on the other hand, is far graver. Of the psychosomatic symptoms the orthopaedic symptoms have the best prognosis, effort syndrome the worse, while gastric symptoms are midway.

(iii) *The Branch of the Service and Rank.*

The effects of these are shown in Table XIII.

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TABLE XII.—*The Relation of the Presenting Symptoms to Prognosis.*

Symptom.	Total.	Percentage evacuated.
Head	78	33·3
Chest	35	48·5
Alimentary tract	40	32·5
Back and neck	24	16·7
Genito-urinary	17	41·2
Legs	15	26·6
Others	31	42·0
All psychosomatic	240	34·6
Anxiety	220	35·4
Depression	34	67·8
Total	494	35·2

TABLE XIII.—*Relation of Branch of Service to Prognosis.*

	Total.	Officers.						
		Inf.	R.A.	R.A.C.	R.E.	Others.	R.A.F.	Total.
Number	494	13	11	3	8	29	25	89
Percentage evacuated	35·2	39·2	27·2	33·3	12·5	51·6	52·0	42·7

	Other ranks.						
	Inf.	R.A.	R.A.C.	R.E.	Others.	R.A.F.	Total.
Number	174	78	31	—	82	40	405
Percentage evacuated	40·2	46·0	29·0	—	30·5	15·0	36·0

In the Infantry and Artillery the evacuation rate of officers and other ranks was very similar; but in other arms and services the proportion of officers was higher. The proportion of R.A.F. officers evacuated was nearly three times as great as that of airmen. As has been seen elsewhere (Table X), these R.A.F. officers were largely suffering from domestic and physical stress. The reason for a high rate of evacuation is partly the different policy adopted in this area by the R.A.F., namely that it was better to send a useful officer home to recover completely there than to employ him in India in part-time or unsatisfactory work. The follow-up of these cases is not available, but it is certainly a point of view which avoided deterioration overseas. There was no adverse effect on the morale of the remainder to be observed.

(iv) *The Length of Service.*

On compiling the Appendix, it did not seem as if the total length of service had any particular significance. That of overseas service, however, is of interest. The figures shown have been collected in Table XIV.

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APPENDIX.—*Analys*

Symptoms.	Result.	Constitutional factors. Previous personality.				Environmental factors. Domestic.				Physical		
		Dull.	Neurotic.	Normal.	Excellent.	Enemy action.	Infidelity.	Separation.	Other.	Mal.	Amoeb. dys.	Others.
Headaches	R.T.U.	4	10	33	5	12	—	7	1	1	1	—
	Evac.	9	3	12	2	1	3	3	2	4	1	—
Chest	R.T.U.	1	5	12	—	4	—	3	—	1	—	—
	Evac.	4	4	6	3	4	1	2	2	3	3	—
Alimentary tract	R.T.U.	3	7	14	3	3	—	7	1	—	2	—
	Evac.	5	4	3	1	4	—	3	—	—	2	1
Back and neck	R.T.U.	1	4	14	1	1	—	2	—	1	—	—
	Evac.	—	—	3	1	—	—	—	—	1	—	—
Legs	R.T.U.	1	2	8	—	—	—	—	1	—	—	—
	Evac.	1	—	3	—	11	—	—	—	—	—	—
Genito-urinary	R.T.U.	1	5	3	1	2	—	2	—	1	—	—
	Evac.	4	1	2	—	1	—	1	—	2	—	—
Others	R.T.U.	1	6	7	4	1	—	3	—	—	—	—
	Evac.	5	3	5	—	2	—	3	1	2	—	—
Anxiety	R.T.U.	13	45	65	19	35	3	13	14	5	4	4
	Evac.	9	8	53	8	14	9	18	14	5	4	2
Depression	R.T.U.	2	1	6	—	2	—	2	5	1	1	—
	Evac.	2	3	16	2	4	8	3	5	1	1	—
Total	R.T.U.	27	85	164	33	60	3	39	22	10	8	13
	Evac.	39	20	103	17	32	22	33	24	18	11	3
Grand total		66	111	267	50	92	25	72	46	28	19	10

TABLE XIV.—*Evacuation Rate Related to Length of Service Overseas.*

	Half-years.			
	First.	Second.	Third.	Fourth.
All psychoneurotics	57	70	65	62
Percentage evacuated.	26·3	37·0	36·8	42·6
All from domestic stress	15	18	10	17
Percentage evacuated.	40·0	38·7	50·0	58·7

The rise in the rate as service increases is clear.

(e) *War Aims and Faith.*

These factors were not easy to assess numerically, and their effect in any given case was hard to determine with precision. There can, however, be little doubt as to their importance, and this can best be described by outlining some circumstances.

(i) *Distance from the enemy.*—There is general agreement among officers that the further troops are away from the enemy the lower is their morale; although probably *apparent* distance is more important than *real*. The "stimulus of battle," in Mr. Churchill's phrase, is absent, and the demoralizing effect of feeling "out of the war" has been remarked. War aims are less easy to visualize. On the other hand, speeches and visits from war leaders, which stressed the value of every man everywhere, raised morale again.

(ii) *Loss of focus.*—Many soldiers' war aims needed a rather more concrete form than "patriotism" or "democracy," and no doubt a large number visualized themselves as fighting for their home, wife, family—generally

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ors and Symptoms.

Environmental factors.								Branch of service and rank.							
Physical.				Employment.				Other ranks.					Officers.		
Back and neck.	Chest.	Head.	Others.	Frustration.	Inadequacy.	Nil.	Several.	Infantry.	Artillery.	R.A.C.	Others.	R.A.F.	Army.	R.A.F.	Total.
—	1	5	11	6	9	2	5	18	8	4	11	9	—	2	52
—	1	1	4	2	6	1	4	10	2	3	5	3	1	2	26
—	4	—	1	1	1	3	2	7	5	—	4	2	—	—	18
—	3	—	1	1	3	—	4	6	5	—	4	1	1	—	17
—	—	—	1	1	5	1	4	12	5	3	5	—	2	—	27
—	—	—	—	1	3	2	3	6	2	—	3	1	1	—	13
12	—	—	1	1	3	—	2	7	3	1	2	4	3	—	20
2	—	—	—	—	—	—	—	2	1	1	—	—	—	—	4
—	—	—	—	1	1	—	—	6	2	—	2	—	1	—	11
—	—	—	—	—	1	—	1	—	3	—	—	1	—	—	4
—	—	—	1	—	2	3	1	4	1	—	1	2	2	—	10
—	—	—	2	—	2	1	3	5	1	—	—	1	—	—	7
—	—	—	8	1	5	—	2	9	1	—	4	1	2	1	18
—	—	—	2	1	1	4	2	5	5	—	1	2	—	—	13
—	1	4	21	18	39	7	24	44	15	14	27	8	25	9	142
—	1	2	13	—	12	4	17	19	14	4	12	3	16	10	78
—	—	—	1	1	2	—	4	3	3	—	1	—	4	—	11
—	—	—	1	1	5	—	6	11	2	1	—	2	6	1	23
12	6	19	44	30	67	16	45	110	43	22	57	26	39	12	309
2	5	3	23	6	33	12	40	64	35	9	25	14	25	13	185
14	11	12	67	36	100	28	85	174	78	31	82	40	54	25	494

idealized—rather than for England. Consequently the news or even suspicion of damage to wife, or family, or a loss of their ideas left these soldiers with little to fight for. No doubt this was one reason why domestic stress was more common among other ranks relatively than officers, and why its effects were so serious, and again why prognosis in dullards was worse.

(iii) *The soldier's sense of his own value.*—Both these instances are examples of the effect of weakening the soldier's ultimate war aims. His morale may be attacked in another way by factors which lower his confidence in himself, or his sense of his own value. Frustration produced by unsatisfactory employment has been already discussed. Lack of information about his own role and how it fitted into the war effort was equally disastrous.

His sense of craftsmanship, too, was a faculty often neglected.

(f) *Group Relations.*

The soldier's sense of comradeship is too well known to need description, but is sometimes also too well known to consider. Many patients were seen in whom it was entirely absent. The old system of the county regiments grouped together men of similar nature and like interests. Unfortunately the system often broke down under the need for reinforcements, and it was difficult to ensure that convalescents always returned to their old units.

Confidence in leadership is naturally of the utmost importance. It is connected with the soldier's sense of security, and is, therefore, especially in demand when the latter is damaged by, for example, bad news from home. Certain soldiers' criticisms of leaders have been quoted in this text and case material, and it may be objected that these emotional attitudes are based on

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false impressions; that is, that the soldier has misunderstood the motives of his officers. This may well be so, but (at the risk of being obvious) it must be pointed out that what matters is not whether an impression is true or false, but whether it exists. On it depends the soldier's mental health.

It has also been objected that reactions such as have been described are uncommon, and only occur in already demoralized soldiers. To investigate this, an opinion survey of 895 soldiers in transit in Burma was taken by Browne, Coates and Wells (1946) at my direction. Their findings included the following:

"1. The soldier feels a considerable amount of dissatisfaction with the amount of information he has been given on the conditions he will encounter when he comes abroad.

"2. There is evidence of mental unrest concerning the possible ill-effects on health in years to come of service in this theatre.

"3. There is evidently extreme discontent at what is felt to be excessive disparity in the privileges enjoyed by the higher ranks in contrast to those of the lower. To make matters worse, officers frequently make no effort to conceal the fact that they possess privileges . . . and indeed flaunt them in the other ranks' faces." (This it was emphasized was in a base area several months after the war, not in combat conditions.)

"4. There is lack of sufficient explanation of the various aspects of military discipline and organization."

It will be seen how these various conditions, which affect the soldier's war aims and his relations with his group, illustrate the importance of the criteria laid down by McDougall and Freud as necessary for successful group behaviour.

Summary of Findings.

The salient findings may be summarized as follows:

A. *Incidence.*

(1) The incidence per 1,000 healthy troops in the Far East was rather greater than that in the west, and there were records of several sharp increases.

(2) The ratio of psychosis to all psychiatric casualties was higher in the east than in England. This increase was composed mainly of "schizophrenic" conditions, both in the Middle and Far East, but at the end of the Japanese war a series of manic states occurred and so produced a further rise locally. At this period the incidence of psychoneurosis was abnormally low.

B. *Symptomatology.*

(1) The symptomatology of psychoneuroses showed little variation from those in the west.

(2) The series of manic states just mentioned presented unusual features, and generally a good prognosis.

C. (i) *Constitutional Factors.*

(1) The findings of psychoneurotic traits gave little reliable prediction of breakdown; but dullness increased the liability.

(2) Certain previously well-adapted men broke down under severe stress and some developed psychoses.

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(3) Officers were relatively more prone to anxiety, depression and manic states than other ranks—particularly staff officers of an over-conscientious type.

c. (ii) *Environmental Factors.*

(1) Physical factors were more commonly present than others (and were found in 50 per cent. of psychosomatic states). Domestic stress and unsatisfactory employment were roughly equal in numerical importance.

(2) Domestic stress (especially infidelity) generally resulted in anxiety and depressive states. The severity of its results increased with length of service overseas.

(3) Frequently several factors were associated; in particular physical factors were often found to have produced psychological breakdown in soldiers who were also under emotional strain.

(4) These emotional strains were of various kinds:

(*a*) Anxiety from separation from home, or over home affairs.
(*b*) Fear of serious disability.
(*c*) Anxiety over inadequacy at work.
(*d*) Fear of danger.
(*e*) Resentment at unfair treatment.
(*f*) Frustration.

(5) A heightened suggestibility also occurred after emotional stress was over, or when a patient was in a doctor's presence. A general lowering of resistance often resulted from debilitating physical disease.

(6) The actual emotion experienced by any individual under stress depended not only on the type of stress, but on his personality structure, itself largely dependent on his past history. Thus certain men had a disproportionate response to certain stresses only. Others—less common—had a low resistance to all stress.

(7) The type of symptoms produced depended generally on the type of physical factor operating.

(8) Bad employment was more likely to affect officers than other ranks. The officers concerned were largely from the services—as opposed to the arms—or from staff appointments. Unsatisfactory employment was the commonest group of causes among officers.

(9) The syndromes these officers developed were of two main groups:

(*a*) Depression and apathy.
(*b*) Restlessness and tension, not clinically very remote from hypomanic excitement; borderline cases were recorded.

(10) Lack of war aims and of confidence in leaders contributed to psychological illness.

Review of Literature.

A survey of the literature dealing with the mental health of soldiers in the Far East necessarily includes work done in other theatres, for the sake of comparison. It is best reviewed under several heads:

A. Surveys of the incidence of psychiatric cases.
B. Surveys of the symptomatology.
C. Surveys of the factors which affect mental health.

These have been grouped under the terms "environmental" and "constitutional."

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A. *Incidence of Psychiatric Cases.*

There are three ways in which a numerical survey of psychiatric cases may be of interest. These are: (i) The incidence rate per cent. or per thousand of the total strength (i.e. of all troops, healthy and sick), (ii) the ratio of mental abnormalities to the total medical casualties, and (iii) the distribution of different syndromes within the total of mental abnormalities.

It is probable that these three figures will give more information if considered together rather than if separately.

(i) *Incidence per Strength.*

The incidence of psychiatric cases per strength (of 1,000 say) is not always easy to estimate, for the total number of troops in any area and any period is subject to much fluctuation as well as to stringent secrecy (at the time). Broad figures have, however, been published both for admissions to hospital and for out-patients.

Admissions to hospital.—In 1944 and 1945, in the United Kingdom, sample months showed a variation between 0·40 and 0·5 psychiatric admissions to hospital per 1,000 strength per month. In the Middle East over this period the admissions ranged from 0·8 to 0·9, i.e. practically double the rate in the United Kingdom (*Bulletin of Army Health*, 1945).

Out-patients.—Out-patient figures for the same period were naturally higher; in the United Kingdom they ranged from 1·3 to 2·2 per thousand per month, and in the Middle East Force from 1·3 to 2·0 (*Bulletin of Army Health*, 1945).

Civil life.—It is not irrelevant to compare these with rates in civil life. Blacker (1946), in a valuable survey, showed these were lower throughout the country than the service rates. He considered, however, that the rate of attendance increased where there was awareness among the population (that is, both patients and doctors) of a psychiatrist's presence and functions. While we may assume that this is in part the reason for the greater rate in the army, where awareness of the psychiatrist extends even further (beyond the patient and his doctor to his Commanding Officer), there can be no doubt that the chief cause of the increase is to the greater stress which is entailed in adaptation to military life.

It is less easy to see why the admission rate in the East should be greater than at home, whereas the out-patient rates in the two are practically the same. The significance of this is presumably that while psychiatric disease is not numerically greater in the East, it is more severe. A study of the distribution rates may show why this is so.

(ii) *Ratio to all Disabilities.*

In December, 1914, " nervous and mental shock " accounted for 7–10 per cent. of *all* officer casualties, and 3–4 per cent. of all other ranks, but for the whole war the rate was probably much higher, and it is known that at times 40 per cent. of cases evacuated were due to neurosis (*History of the Great War*, 1931).

In the 1939–45 war psychiatric disorders were responsible for 10 per cent. of all British troops evacuated from the European theatres.* They have also been responsible for between 34 and 40 per cent. of all discharges on medical grounds from the British Army—the six-monthly periods from 1 January, 1943 to 31 December, 1945, show 34·0, 35·7, 40·4, 40·5, 38·4 and 38·6 per cent. in chronological order (*Bulletin of Army Health*, 1946).

A further report of some significance is that of Squires (1933) that of 353 men invalided from the colonial service 45 per cent. were psychiatric cases (28 per cent. being psychoneurotics). Squires also pointed out that these cases were predominantly men in their first four years of service, whereas in England psychiatric disabilities had been spread evenly over 25 years' service.

In any consideration of these figures, however, it must be noted that the proportion of psychiatric cases to the total number of medical cases does not necessarily indicate the rise or fall of the former, since the latter is by no means constant, and may suddenly change on a large scale—e.g. from an increase of wounded after battle or a decrease of malaria from the introduction of mepacrine. It is, therefore,

* This figure is based only on a two months' sample for authority for total figures is not yet obtainable.

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not possible to conclude more from these figures than that psychiatric disorder is an important cause of wastage of man-power in both wars. Its effects on the health of society in peace, and on the cost of pensions, seem likely to be equally serious.

(iii) *The Distribution of Various Types of Mental Abnormality.*

A study of historical accounts inevitably leads to the conclusion that the criteria for diagnosis have not been constant. The contradictory views of medical authorities were well shown by the *W.O. Enquiry on Shell Shock* (1922). While some contradictions still exist—particularly in regard to conditions with a physical component—nevertheless, on the whole, in World War II more definite standards of diagnosis were used for Imperial troops, and reports from different theatres may thus be compared. No doubt even here there will be inaccuracies, but since they will be roughly of the same order, the comparison may still be valid.

In considering reports of the distribution of the various types of condition, i.e. psychosis, psychoneurosis, and mental deficiency, it should be borne in mind that the last term is used in the army nomenclature in a broader sense than in civil life; in the army it includes dullards as well as defectives who are certifiable under the Mental Deficiency Acts of 1913 and 1927.

The relative proportions of various broad groups of disorder have been given by several authorities. James (1945) quotes the official statistics of the war, which show that the percentages among out-patient British troops in the Middle East Force were as follows:

	Psychoneurosis and psych. pers.	Mental deficiency.	Psychosis.	Others.	Total.
October–December, 1943	74·1	4·9	7·4	13·5	100
January–June, 1944	77·2	6·0	4·9	11·9	100
July–December, 1944	74·0	5·7	5·5	14·9	100
January–March, 1945	73·3	4·3	6·3	16·1	100

From official figures out-patients in the United Kingdom over nearly the same period were:

	Psychoneurosis and psych. pers.	Mental deficiency.	Psychosis.	Others.	Total.
January–June, 1943	57·0	29·0	2·9	11·1	100
July–December, 1943	60·4	25·6	2·6	11·4	100
January–June, 1944	70·9	16·7	2·4	10·0	100
July–December, 1944	78·5	10·9	2·2	8·4	100

(*Bulletin of Army Health*, 1945.)

Rather different proportions are given by Ballard and Miller (1944) in a study of 2,000 consecutive R.A.F. out-patients in England. Of these 1,366 were psychoneurotic, 62 mentally deficient, 45 psychotic, 2 malingerers, 30 n.a.d., and 495 organic, medical and neurological cases. The total psychiatric cases would then be 1,473, and the percentages of this total would be psychoneurotic 92·7, mental defectives 4·2 and psychotics 3·1.

Psychotics do not always pass through out-patient departments, for they may be admitted direct to hospital. A study of their rate in hospital admissions will, therefore, provide evidence of the proportion of psychosis to the total *severe* psychiatric disorder; and so enable the importance of psychosis to be seen from another angle.

The figures for the percentage of psychosis to all psychiatric admissions (British troops only) are available from official sources (*Bulletin of Army Health*, 1945). In the Middle East they were as follows:

October–December, 1943	19·0%
January–June, 1944	31·3%
July–December, 1944	23·0%
January–March, 1945	28·1%

In the United Kingdom, figures are given for roughly the same periods. Besides giving the rate for all ranks they also give the rate for officers (that is, psychotic officers to total psychiatric officers) and other ranks (similarly).

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These are as follows :

	All ranks.	Officers.	Other ranks.
April, 1942–March, 1943 . .	25·3%	30·1%	25·0%
April, 1943–March, 1944 . .	26·5%	45·8%	25·4%
April, 1944–December, 1944 .	16·3%	19·5%	16·2%
July and August, 1945 . .	20·3%	21·0%	20·2%

In the Far East the problem is no new one ; as Miller, Wilson and Wittkower (1949) point out, the Duke of Wellington complained of the mental changes of his officers while serving in India. Nevertheless, no gross figures to compare with the above are available. There are, however, separate reports from corps or divisions in Burma by Miller (1945), Hurley (1945), Matas (1945) and Davis (1946). These are most easily expressed as the rate of psychosis in total psychiatric casualties, and have been summarized as a table for the sake of convenience.

Unit (and authority).	Date.	Total psychiatric casualties in British troops.	Percentage of these psychotic.
Miller (1945) . .	1944–45, March–March	248	5·23
Davis (1946) . .	1944–45, March–March	?	3·0
Hurley (1945) . .	October, 1943–July 1944	565	5·30
Matas (1945) . .	September, 1943–February, 1944	354	6·5

If these figures are considered as a whole, it is reasonable to conclude that the admission rate (per total strength) is greater in the East, because there is a higher proportion of psychosis there. There is also a lower proportion of defect. It is possible that the decrease in defect may be regarded as a tribute to the process of selection of drafts awaiting service overseas. It is also possible that fewer men are classed as defectives because defectives developed psychosis or psychoneurosis, and so were classified under the latter and not under defect. However this may be, there seems an absolute increase in psychosis. No explanation is given for this by those who compiled these figures ; nor is there any explanation for the high proportion of officers among them.

B. *Surveys of Symptomatology.*

These are best described under—

(i) Psychoneuroses.

(ii) General.

Psychoses have been described fully elsewhere (Tredgold, 1947).

(i) *Psychoneuroses.*

Although it was at one time fashionable to speak of " war neurosis," it is now generally accepted that " there is nothing specific about the mental breakdowns that occur in war " (Curran and Guttman, 1945).

But the relative incidence of the various syndromes in war differs from that in peace, as was clear from the W.O. Enquiry (1922). Moreover, it was reported there by Head that the types varied with rank, for the vast majority of anxiety states were in officers, while conversion hysteria was practically confined to other ranks.

The proportion, moreover, of officers to other ranks among psychiatric cases was about 1 : 14, whereas the normal proportion in combatant units is about 1 : 30.

In this war the consensus of opinion has been that anxiety has become relatively much commoner among British troops, and hysteria correspondingly less so (Ballard and Miller (1944), Craigie (1944), Grinker and Spiegel (1944)). On the other hand, there has been an increase of psychosomatic symptoms noted by Dunn (1943), who makes the significant remark, " With the remarkable decline of the neurotic manifestations in the last war, i.e. anxiety states and conversion hysterias, the emotional tensions generated in this war are appearing as psychosomatic disorders."

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Also Curran (1945) quotes a report from German sources that anxiety states were not common in the German Army; even in the retreat from Russia (ideal in some ways in producing mental stress) little anxiety was seen, but inquiry elicited the prevalence of psychosomatic disorders which had apparently replaced it—possibly an example of how the type of symptom was determined by the doctors' expectation and attitude.

The classification and terminology of these various types of psychoneuroses has become a little confusing, and Ewalt (1944) attempted to clarify it. He described two groups of conditions which were both reactions to emotional and/or environmental stress, and which both showed physiological (but not structural) alterations. Unfortunately he termed these two groups (*a*) simple anxiety and (*b*) psychoneurosis, according as to whether somatic symptoms were absent or present. Finally he placed in a separate group (*c*) cases which showed alterations of structure as well as of function, and due also to an emotional reaction.

Ewalt's choice of the term psychoneurosis is not very helpful; for this term is generally used for a larger group than the one he so designates; but (apart from this) his concept of a separate group of this kind does help to clarify the position.

c. *Survey of Factors.*

This may be subdivided into two groups:

(i) Constitutional.
(ii) Environmental.

(i) *Constitutional Factors.*

These are best regarded from the points of view of (A) the psychoneuroses and (B) the psychoses. Separately, under another paragraph (C), is a short discussion of the positive aspects of the personality.

(A) *Psychoneuroses.*—A discussion of the constitutional factors involved at once raises an ancient controversy. As Dunn (1941) pointed out after reviewing the literature, there are two major schools of thought; one is a tendency to consider all neurotic reactions as predominantly constitutionally determined, with an inherent predisposition; the other accepts the importance of inherited predisposition in some cases, but would stress that soldiers of previously sound personality may break if the strain is severe enough or too prolonged. The strain may be mental or physical, or both. Personality is, in the phrase of Menninger (1937) "the individual as a whole . . . all that anyone is, and all that he is trying to become."

The difference of thought is not merely in the ranks of the medical profession. It exists equally sharply in the Army. The first opinion was accepted at the beginning of the war by a number of senior officers, who were convinced that if a man broke down this proved that he had in fact "always been yellow," however good his previous record had been. This argument rendered terminology meaningless; the best military test of the soldier's personality before was surely how he had in fact reacted; and if he had done so satisfactorily, later efforts to regard him as "always unstable" are beside the point.

The second school's opinion is that some (not all) cases of psychoneurosis occur without inherent predisposition. This school has received increasing support from the studies of battle casualties made at the time of Dunkirk (Sargant and Slater, 1940) till reviews of several years of war now available (e.g. Strecker and Appel, 1945).

Since both schools agree that there are predisposed individuals, there has naturally been much consideration as to how these can be detected. It has mostly been along three lines of study: those of (i) psychoneurotic traits, (ii) heredity, and (iii) personality types.

(i) *Psychoneurotic traits.*—There has been much argument on the importance of so-called psychoneurotic traits. Among the latter are classed enuresis, nail-biting and stammering—to mention a few.

Some of them are no doubt often associated with unstable individuals; but they are also known to occur in the healthy and in the brilliant. To meet this difficulty, Porter (1943) suggested that they might have a cumulative importance; he thought that the possessor of six of the above traits was a candidate for breakdown, while the presence of four only might be disregarded. But he described a

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control group of apparently normal men, who showed nearly as many pathognomonic signs as an equal number of breakdowns, which scarcely supports his theory. Similarly Sheps (1941) described a series of " successful soldiers " ; 58 of these had been stable in battle, but 34 of the 58 showed some abnormal traits.

Hastings, Wright and Glueck (1944) have demonstrated in their review of the Eighth U.S. Air Force (first year) that 50 per cent. of 150 men who successfully completed tours of combat had a previous record of emotionally unstable behaviour, and often some family instability. But Anderson (1946) shrewdly comments that this only shows (*a*) that combat is not all-important, and (*b*) that their service did not expose them to specific situations to which they had been previously sensitized. Anderson's view is that patients respond in the light of past experiences and psychological wounds remaining in their personality structure.

(ii) *The influence of heredity.*—This was investigated by the Medical Department of the U.S. Army (1929), but there was scarcely any significant difference between psychiatric cases and normal soldiers.

(iii) *The question of personality types.*—This was discussed by many witnesses, medical and combatant, before the War Office Enquiry into Shellshock (1922), and although there was a general opinion that the majority of cases (though never all) could be predicted, there was little agreement on the type of personality most likely to suffer. (On the other hand, the value of " man-management " in preventing " shell shock " was accepted by all.)

Various authors have delineated certain types of personality which they consider particularly likely to develop psychoneurosis.

It is obviously difficult to fit all cases into any scheme of classification, but attempts have been made by several writers. Stungo (1946) described four groups: (i) steady, sober and rigid ; (ii) responsible, over-conscientious ; (iii) dependent and immature ; and (iv) constitutionally inferior. Halliday (1943) made also four groups and specified their probable symptoms under stress : (i) histrionic—autonomic ; (ii) hypersensitive—asthenic ; (iii) self-assertive—ulcer ; and (iv) self-instructing—rheumatic. But he points out that the assessment of types is still very inadequate. In fact, it seems doubtful if a useful purpose can be served by attempts to force all cases into one or other group ; the latter of necessity become so broad as to be of little value.

Nevertheless there are certain types which are recognized by many writers to be of particular significance : (*a*) The over-conscientious obsessional active type was found by Wishart (1937) to be the commonest in effort syndrome. Wittkower, Rodger and Wilson (1941) agreed that it accounted for 40 per cent. of cases they saw, and considered overwork or fear (generally a fear of being afraid in battle) the usual precipitating factors. Crile (1940) said that the majority of patients with effort syndrome (as well as peptic ulcer, and hyperthyroidism) were of the active and energetic type called " energetic, obsessional, irritable," found by Gainsborough and Slater (1946) in a disproportionate number of proved cases of peptic ulcers ; these authors concluded there was an over-activity of the vegetative nervous system.

The over-conscientious obsessionals have been found by Culpin (1931) to develop frustration unduly easily. A sense of urgency produces overwork and no rest is allowed. This may result in depressive features (Gillespie, 1942). Culpin quotes an obsessional who developed typical manic-depressive cycles.

Explanations of this have been given in psychopathological terms. Wittkower and Spillane (1940) suggest the basic personality structure may be weak because it is characterized by self-centredness, lack of sociability and lack of affection ; the danger of death is to the patient a threat to his self-love, and his response is to regress to a narcissistic level ; his ego-libido becomes inflated, and the abnormal sensations resulting produce hypochondriasis. In the view of Freud (later quoted in detail) individuals exposed to frustration are likely to break down if they are of certain types ; of which the rigid individuals, and those whose libido never frees itself from infantile fixation, perhaps may be taken to correspond respectively to this over-conscientious type and to the dependent type now to be described.

(*b*) The dependent type is considered by Fairbairn (1943) to be the most important. He states that it formed the bulk of cases in an E.M.S. hospital, and suggests the whole problem of a predisposed personality is merely one of emotional dependency. It is probable that this view, based on the more chronic cases, is too sweeping.

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Alexander (1934) considers that dependence is always to be found in gastric neuroses; but admits that in some it takes the form of an over-compensation, which presents the picture of ambitious efficiency. Dunn (1942*b*) has observed the dependent and the responsible types associated with gastric symptoms.

(*c*) The histrionic type—one of Halliday's groups—is considered by Ellman, Savage, Wittkower and Rodger (1942) to develop rheumatic pains.

Mention must also be made of the dullard. The liability to psychoneurosis has been widely recognized in the Army, e.g. Hargreaves (1940). Brooks (1929) commented on the number of ineffectual manual labourers among his cases of effort syndrome.

(B) *Psychoses.*—This has been discussed elsewhere (Tredgold, 1947).

(c) *Positive Aspects.*

In all these writings surprisingly little attention has been paid to the more positive facts of character. Nevertheless, it is apparent that the prediction of psychological breakdown can be regarded as analogous to that of cardiac breakdown, and can be made in the same way, by assessing the functional capacity and comparing it to the coming stress. The capacity can be gauged from symptoms and signs, in psychic or cardiac trouble alike. In fact, many military psychiatrists have admitted that their assessment is much helped by the reports obtained from the unit officers about the patient's behaviour and efficiency. These officers were excellent diagnosticians, or rather prognosticians, and sometimes took great care to keep a particular soldier out of battle because he was " obviously no good," not because of specific traits—they had in fact little idea whether he bit his nails or not.

Thus in practice a more positive approach is being made. But more definition is still needed, and more information about the assets of a man's character and their significance. In this respect the records of officer selection boards may later provide valuable material. An assessment of " officer quality " is not made solely from the angle of defects, or there would be grave errors and probably the loss of brilliant men. The candidate is, instead, regarded from the aspect of the balance between his good and bad qualities—which is a point forgotten by some who ask (in all innocence ?) whether Nelson or Napoleon would have passed a modern selection board.

As described above, more emphasis is now being put on personality types than on psychoneurotic traits. Moreover, the former concept indicates certain possible lines for preventive psychiatry. Consideration of this will include the positive factors as well as the weaknesses. Thus the over-conscientious type is obviously not one to be exposed to situations where frustration is likely; he must, moreover, be helped to find a substitute goal, and particularly must he avoid the ways of regression to infancy and of fantasy. That is, he must have as much interest as possible, and he must not be kept idle in a hospital where the restrictions remind him of his childhood. The positive aspects of his personality must be encouraged.

(ii) *The Environmental Factors.*

These are best discussed under various headings as follows:

1. Enemy action.
2. Domestic affairs.
3. Physical health.
4. Employment.
5. War aims and faith.
6. Group relations.

It is clear from the literature that it is often difficult to decide what particular factor is responsible for mental ill-health; or if several factors are evident, to decide on the most important. Some writers group them by their time of action as predisposing and precipitating; but naturally any factor may predispose in one case and precipitate in another, without changing its nature. It seems best, therefore, to consider the nature of the various factors under the six groups given above; bearing in mind that in each type there will be favourable as well as unfavourable circumstances.

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1. *Enemy Action.*

The immediate effects of enemy action on the mind of the soldier have been described and analysed by many writers, in the war of 1914–18 (of which the *War Office Enquiry into Shellshock* (1922) gives a summary), and in that of 1939–45. The twin pictures of anxiety and hysteria in the front line have been drawn and redrawn again and again. The precise importance of battle stress is not always easy to measure, and there is some divergence of views on the subject. James (1945) estimated that only 35 per cent. of the 4,000 cases he investigated from the Middle East were due to battle. Ballard and Miller (1944) said that only 15 per cent. of the 2,000 R.A.F. cases they saw were even from operational stations. Mullinder (1945) thought that out of 138 psychotics from Normandy, 127 were due to battle. Tooth (1944), writing of sailors, attributed 193 of 398 cases to enemy action. The position naturally varies with many circumstances.

Besides the *immediate* effects of battle, these authors have also described the *remote* effects. The latter have undoubtedly contributed to many breakdowns in base areas; for patients who have been through various campaigns without symptoms or without treatment, and who have later broken under a different type of stress, show a clinical picture obviously derived from the original battle stress.

2. *Domestic Affairs.*

In 1914–18 domestic stress was given far less attention by most British observers than the stress of battle. In 1939–45, however, it came into greater prominence, especially in regard to troops in the east. There were, of course, more soldiers serving in the East than in World War I, and many had over four years' absence from home; even more had for a time the expectation of such absence.

There are two types of stress which may be described, (*a*) homesickness—also known as separation anxiety or nostalgia—and (*b*) domestic calamity. The former is presumably present in some degree in nearly all men parted from home. The latter is actually only experienced by a few unfortunate individuals; but the fear or threat of it may be operative in a much larger number; it may be in the shape of bereavement, illness, financial loss, or estrangement from wife or family.

(*a*) *Homesickness.*—The state of mind of the homesick soldier in the Middle East is very clearly described by Main (1943). Comparable pictures are drawn by Greiber (1945) for American troops, and by Burdon (1944) for British sailors.

The effect of homesickness may be expected to vary at different periods of separation. Main's view was that it began after six months, and steadily increased thereafter; Burdon went so far as to say that two years' service away from home was likely to produce a marked effect in most normal people. Greiber differentiated two periods of maximum effect in American troops, the first between two and four months overseas—which affected the more dependent individuals—and the second between 14 and 24 months. Homesickness may be increased if there is any failure of war aims (Greiber, 1945), or in enforced idleness. The association of homesickness with gastric symptoms was noted by Mitchell and Mullin (1944), who estimated an unusual degree of homesickness in 45 of 50 cases of gastric neuroses. This was not so in 50 control cases of other psychoneuroses.

(*b*) *Domestic calamity.*—The effects of this were also described by the same authors, who regarded it as an important problem. On the other hand, Stephenson (1944) considered that the domestic problems of the sailor in the Far East were less than those of the soldier, and attributed this to his shorter expectation of service away from home (seldom over 27 months). But Tooth (1944) examined 398 cases of psychiatric disorder in two naval hospitals, and found domestic stress present in 90. He considered real or suspected infidelity as the commonest single cause. The invaliding rate of such cases is given by Tooth as 35·6 per cent (to be compared with 29·0 per cent. from battle stress and 22·6 per cent. from "service conditions").

These writings show clearly that the problems of simple homesickness and of domestic calamity in the East both deserve considerable study.

3. *Physical Health.*

The influence of health of the body on that of the mind is a vexed question, and one moreover on which the consensus of opinion has recently changed and is

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perhaps changing still. It is easier to discuss the psychoneuroses and psychoses separately.

(*a*) *The Relation to Psychoneuroses.*

It is not long since many syndromes now considered psychosomatic were regarded as organic ; of these the most instructive is the first :

(i) *Effort syndrome.*—Although this was described by Da Costa in 1871, it was still widely thought of as due to a cardiac lesion until Sir T. Lewis (1918) pointed out that the majority of cases (83·2 per cent.) had no organic lesion, in spite of the fact that 23 per cent. of cases had a past history of rheumatic fever or chorea. He also remarked that heart cases were at that time the second most numerous medical disability.

Since then discussion has largely centred on the question of how much importance is to be given to physical factors and how much to psychological. Most physicians agree that in some cases the first is the cause, in others the second. Thus Hurst (1944) described physical causes, but reminds us that " soldier's heart is often nothing more than a manifestation of an anxiety neurosis." Frazer (1940) advised collaboration between cardiologist and psychiatrist ; Grant (1940) listed as his causes constitutional weakness, exhaustion, delayed convalescence and external infection ; while Parkinson (1941) divided his causes into constitutional, psychoneurotic, infective and myocardial degeneration.

Psychiatrists naturally tend to stress the psychological factor (e.g. Ross, 1940, and Wittkower, Rodger and Wilson, 1941). Moreover, Maxwell Jones and A. Lewis (1941) analysed 100 cases, and while they considered 11 per cent to be partly infective and 11 per cent. due to organic heart disease, they drew attention to the subjective phenomena, and noted that fear was frequently the emotion concerned.

(ii) *The gastro-intestinal symptom-complex has usurped pride of place* in the 1939–45 war, and has been considered to be the most prevalent single type of disease among British soldiers. The increase was thought by Tidy (1941) to have occurred in civil life before the war ; and its appearances later would then be due to the fact that many cases latent in civil life were revealed on enlistment or precipitated by army diet.

Here, again, there is much disagreement as to how often an organic basis is found, and figures range from 89 per cent. (Payne and Newman, 1940) to 32 per cent. (Spillane, 1941). Tidy's view (1941) was midway between the two—65 per cent.—and is based on 2,500 admissions to hospitals, but Tidy pointed out that in out-patients transient dyspepsia, without organic cause, was relatively commoner. This was in fact often to be regarded as a transient failure to adapt, and should respond to reassurance and sedation as an out-patient. Hurst (1941) also stressed the danger that either lack of such treatment, or over-hospitalization, might allow symptoms to be exaggerated or even become incurable. The syndrome may well be called effort dyspepsia (Hill, 1943).

American writers have tended to stress the psychological factors, and this view is supported by the work of Wolf and Wolff (1942). They were able to inspect the living gastric mucosa, and reported that changes in its surface accompanied certain emotions—pallor from fear or sadness, hyperaemia and hypermotibility from anxiety or resentment. The latter were also accompanied by heartburn, and in intense emotion to congestion and haemorrhage.

The question was also studied from the psychoanalytic angle by Alexander (1934). He regarded such organic changes as the end-result of a chain of processes, of which only the first was psychologically determined. (The symptoms were thus contrasted with those of conversion hysteria, which were a direct expression of an unconscious tendency.)

Alexander considered that there were three types of gastro-intestinal disorder which might result from psychological causes ; these he called gastric, colitic and constipation syndromes. The gastric, he thought, was due to a depression of oral-aggressive tendencies and the increase of receptive tendencies, with a chronic over-activity of the stomach (a chronic wish to be fed or chronic dependence). Over-compensation of this might lead to a conscious attitude of exaggerated independence, which he reported in certain cases.

His explanation of the psychological basis of colitis and constipation was, as he admitted, somewhat less convincing ; but he described colitis as a substitute for

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the giving of real values and constipation as a reaction against the obligation to do so; and associated these syndromes with these attitudes in their possessors. Further, Alexander and Menninger (1936) described how the constipation syndrome might result in pessimism, melancholia or paranoid trends.

After reviewing much work, Dunn (1942*a*) makes the significant comment. "The British attitude to the importance of emotional factors is rather similar to that which was present regarding such factors in regard to neurocirculatory asthenia" (i.e effort syndrome) "prior to 1917."

On the whole, then, the rise in gastro-intestinal syndromes certainly seems as likely to be explained in terms of increased psychological stress as by physical reasons.

(iii) *Rheumatic complaints.*—These have been discussed by Ellman, Savage, Wittkower and Rodger (1942), and exhaustively by Halliday (1937*a* and *b*, 1942, and 1943). The latter's view is that at least 40 per cent. of non-arthritic rheumatism is in fact psychoneurotic. As he puts it, "persons who suffer from psychoneurotic illness not infrequently develop a symptom complex, which includes pains or aches and stiffness or limitation of movement with or without loss of power." These symptoms are regarded by many as due to organic disease, and labelled muscular rheumatism, myositis, fibrositis, lumbago, etc. The time and manner of onset may be determined by a combination of physical causes and psychological stress.

The latter may occur in several ways in Halliday's view. A transient emotion (e.g. anxiety or resentment) may become attached either to the site of an old injury or disease, or to the site where disease is feared (thus pleurodynia occurs in fear of tuberculosis). A third determining factor is symbolism; thus resentment or obstinacy may be expressed as stiffness, while aggression may be represented by brachial neuritis or sciatica (a repression of the desire to hit out or kick out).

The importance given to resentment in these views is to be noted.

(iv) *Headaches and dizziness.*—This syndrome is familiar enough to R.A.M.C. officers in the East; it has attracted less attention in print than might be expected. It has, however, been described by Palmer (1945), and from this it seems equally well known in the Middle East (as "Middle East headache"). It should not be regarded as a part of effort syndrome for several reasons: it is not accompanied by features which draw the patient's attention to his heart; the symptoms occur without exertion and are not aggravated by it; they are sometimes the same in the hot weather in England as in troops, they begin soon after arrival in the East, or after working in great heat as may be, for instance, servicing aircraft.

These cases are not sequelæ of heat stroke; indeed, in this connection it may be noted that heat stroke is less common than popularly feared. Thus Leishman and Kelsall (1944) surveyed 11,645 medical cases in a hospital in Western India and recorded only 49 cases due to heat. It is true, however, that any cases of true heat stroke who showed neurological symptoms would have been missed by this survey, and as these do appear in relatively higher proportions in neurological surveys (e.g. MacAlpine, 1946) the total figure will not be quite so low.

(v) *Psychosomatic symptoms in general.*—If these may be considered for a moment as a group, several points may be made:

(*a*) In many writings we see how important is the whole attitude of the doctor. This has been stressed by many psychiatrists—Ross, for instance (1944), and in the U.S. Army it drew a special directive from Menninger (1943). It is also supported by many eminent physicians—Ryle (1939), Tidy (1941), Parkinson (1941) and Conybeare (1945). Ryle puts it: "It is not rare for a patient to present himself in a state of anxiety because a suspicion of disease has been created by an unwise medical opinion." Hurst (1944) reminds the medical officer that he must accept the responsibility of treating his own cases without constant reference to specialists. The dangers of hospitalization were well summarized by the Medical Department of the U.S. Army report (1929): "The general hospital is the culture medium of the effort syndrome."

The importance of the doctor's behaviour must lie in the emotion it engenders in the mind of the patient.

(*b*) This leads to the whole question of the emotion which occurs (from any cause) simultaneously with a physical disability. It will be remembered that several authors discussed this, and described how in effort syndrome fear was common; in the gastric cases, a craving for appreciation; in the rheumatic, resentment. This was not, of course, constant in all cases of these types. A

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shrewd prediction was made by Gordon (1940): "We may have to lay more stress on the significance of the situation present when the breakdown occurred, rather than on the history of the past."

(*c*) In each syndrome controversy has occurred on the relative importance of physical and psychological factors. In the longest discussed—effort syndrome—a middle view is coming to be accepted: that both are important, sometimes one more so, sometimes the other. It is not too much to suggest that a similar answer may be given to all psychosomatic syndromes.

It is also possible that even when one predominates, it is the combination of the two that is essential. Ryle (1936), for instance, has described how the origins of visceral neurosis may be found in previous inflammation, or in a specific sensitization; they may also be precipitated by external factors, such as cold, by fatigue, or emotion, and are predisposed to by the tension of anxiety. Moreover, several of these factors may be combined.

4. *Employment.*

Work may be unsatisfactory because it is too difficult, too easy, or of the wrong kind. The first will generally produce a sense of inadequacy in the individual, the latter two a sense of frustration. In this war the wastage due to unsatisfactory employment has been recognized, and the maximum attention has been given to matching the individual's intelligence and aptitudes with those required for specific jobs. Selection as a regular army procedure is now presumably permanent. Dunn (1941) has surveyed 130 articles (mostly English and American), and concludes: "The best means of prophylaxis is through proper selection of recruits. This is a conclusion now widely accepted. One finds emphasis on this point in nearly all the references." But circumstances may enforce idleness or work realized to be unsatisfactory. It is therefore necessary to consider the results on the individual.

(*a*) *Frustration.*—This term is commonly used to describe a feeling of wasted ability and consequent tension. It generally takes one of two rather different forms; either, first, a state of anxiety, irritability, restlessness, insomnia and some over-activity, with a feeling of underlying unrest, but capacity of doing considerable work—at a cost to subordinates as well as to the [illegible]erer; or second, an anxiety state with depressive features, which at times to he[illegible]s to apathy—a syndrome which, as Gillespie (1942) points out, is n[illegible] Payne a[illegible]e medieval term "accidie," used (significantly) of monks who had mi[illegible]was mid[illegible] vocation.

Although the origin of frustration is in [illegible]ospitals[illegible] work, its effects on the individual may be enhanced by certain condit[illegible]nic [illegible]. Examples of these are:

(i) Idleness combined with *homesickness* has already been mentioned under the latter head.

(ii) Work in *base areas* has been the subject of a special study of officer patients (Tredgold, Heffernan, Kelly and Leigh, 1946). Here it was shown that out of 150 officers evacuated for psychiatric reasons from the Far East, 120 came from base areas. The lack of outlet for aggression and the sense of being out of the war were both considered severe stresses. As Mr. Churchill said, these officers lacked the stimulus of battle; it may be recalled that in *The Aftermath* (1929) he described the difference between the morale of base troops and fighting units.

(iii) *Staff work* increased frustration, and its causes have been described by MacCurdy (1943) in an illuminating account of the effects of departmentalism. Here the lack of outlet for aggression is even more important, for irritation and tension are vented on subordinates, so that a vicious spiral develops. The desire for scapegoats is significant; the next higher formation "they" are always blamed, so that G.H.Q., the apex, inevitably becomes a byword.

Explanations of these phenomena have been given on psychoanalytic lines.

Frustration was discussed very fully by Freud (1912). He applied it first to the removal of an actual object which satisfied an individual's erotic need. Frustration thus dammed up the libido and, therefore, tested both the individual's tolerance of tension and his manner of relief. He could transpose the tension into energy directed towards the outside world, and finally wrest from that world an actual satisfaction for the libido; or he could sublimate it to ends which were no longer erotic, and thus eluded the frustration. There is the danger of the libido becoming introverted, turning away from reality to take refuge in fantasies, generally reanimating earlier ones. Alternatively illness could occur from an internal

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inability to seize a specific gratification offered. From this failure libido again may be dammed up, with similar results. Thus breakdown may occur either because the individual cannot renounce a gratification, or because he is too rigid to accept one.

Freud concludes with the warning that the antithesis of external and internal factors is likely to be unfruitful, and looks for the cause of neurosis in a definite mental situation, which can be brought about in different ways.

Although Freud's original views concerned an erotic need, it would seem from the above and later work (1933) that he included also substitutes. Thus: "The personality is healthy as long as his erotic need is satisfied by an actual object . . . he becomes neurotic as soon as he is deprived of this, and if no substitute is forthcoming." Rosenzweig (1938) discusses the question of frustration tolerance, and compares it with immunization; the normal individual, he considers, has a general high level of frustration tolerance (built up by normal education); the neurotic has a specific area of low tolerance, and the psychotic has many such areas, or a generalized low tolerance. Psychoanalytic treatment can thus be compared with desensitization, and the production of insight as closely allied to the formation of tolerance.

The specific symptom of depression is explained by MacCurdy (1925) as due to egotism outdistancing the supply of energy, and the intellectual endowment. Anxious thoughts and attitudes (significant alike of repression and of a sense of inferiority) appear in consciousness.

(*b*) *A sense of inadequacy.*—Little has been written about this result of unsatisfactory employment, though careful observers have noted it as a fundamental complaint. It is naturally often masked, and the individual seeks refuge in frank psychoneurotic complaints. The size of the problem was not widely realized before World War II, though it had been reported by a few—for example, Sandiford (1938), who was able to implement his own recommendations on his later appointment as first Director of Army Psychiatry.

There are certain other aspects of the employment which have drawn attention; notably the effects of (i) the type of unit and (ii) of the pace of work.

(i) *Incidence in different branches of the service.*—The distribution of cases in different branches of the service has been recorded by few writers. Evidence was scanty before the W.O. Enquiry (1922), but indicated that technicians in forward units might suffer unduly. James (1945) quoted that in the Middle East psychiatric cases were split up into the various branches of the service in a ratio which did not correspond to the normal distribution.

	Infantry.	Artillery.	Armoured Corps.	Other branches.	Total.
Psychiatric cases	22%	20%	12%	46%	100%
Normal strength	17%	22%	9%	52%	100%

James also commented that doctors averaged 9 per cent. of all officers admitted on psychiatric grounds.

(ii) *Changes in pace of work.*—An interesting effect on sailors of the pace of work and of changes in it is described by Curran and Garmany (1944) under the term "change of tempo." In their view the tension on life afloat developed an increased readiness and responsiveness, which persisted ashore as an anxiety state. It was emphasized that this occurred in men of apparently excellent personality, who had shown no overt signs of anxiety at sea. In the condition, there were both psychological and biological components, and it was to be regarded as an indication of a biological need to sustain the tesnion—that is, to make the environment suit the state of mind. A similar mechanism was presumably responsible for the occasional desires of fighter pilots and commandoes to spend their leave in excitement, e.g. on a destroyer. In fact, sedation and an early draft to sea were found to be beneficial. Symonds (1943) mentions that there is a greater tendency to delayed fear reactions among flying casualties who have to remain idle than among those who can be reoccupied at once. No doubt here an additional cause is increasing loss of confidence from absence from duty.

5. *War Aims.*

In morale, a fundamental factor is the soldier's faith and his conviction of the need to win. Napoleon's comment (1808), "in war the spiritual is to the material

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as three to one," has been amplified by Montgomery (1945): "I call morale the great single factor in war. A high morale is based on discipline, self-respect and the confidence of the soldier in his weapons and himself." He also has no doubt of the connection of morale and health. "The morale of the Eighth Army is quite amazing. It has shown itself in a marked way in the sickness rate." In this connection may be recalled Sillman's quotation (1943) of Bermann's comment that Loyalist Spanish soldiers who had enlisted from conviction suffered less from neurosis than did conscripts.

This was, of course, well known to the great leaders of history, whose victory in the field was often determined by their methods of training months before. Their writings are taken up more with morale building than with selection. It is only in the last war that selection procedure has been even as scientific as the classic experiment of Gideon at the well of Harod (Judges, vii).

There have been commanders like Henry V, who urged all to depart who had no stomach for the fight; but they seem to have done so more as a tonic for morale than as a means of selection. On the other hand, between Joshua's "Be strong" and his trumpets at Jericho to Montgomery's "I am not interested in plans for retreat" at Alamein, there is a long record of leaders' inspiration to morale, and their success is a measure of their power to embody their followers' war aims; it matters little whether the phrases are Cromwell's in 1644 or Churchill's in 1944.

The efforts of psychiatrists to deal with the subject have been hindered a little by prejudice, which is inevitable when new methods are applied to ancient convictions. Barrett (1944) has this in mind, presumably, when he writes of the U.S.A.F., "Under certain conditions every man will welcome whatever help he can get; the popular prejudice against things of the mind is diminished or absent." Moreover, much of the earlier work of doctors was concerned with the study of unfavourable factors in the environment, and it is surprising to find that the favourable were relatively neglected. But it is on the balance between favourable and unfavourable that the individual's impression of the environment depends; to increase the one is, therefore, as important as to decrease the other.

6. *Group Relations.*

The soldier's relations to his comrades and to his leader clearly influence his personal morale. The study of group behaviour and its fundamental psychological principles is, therefore, not irrelevant, but it is impossible here to do more than outline certain of the views of eminent writers, and those will be selected which are applicable to problems of service in the Far East.

Le Bon's original study (1920) described the group as very credulous, suggestible and lacking in critical power; very simple and labile in its emotions; excited by dramatic force and repetition, rather than by logic; to be ruled by authoritative behaviour. MacDougall (1920) drew a similar picture, but went further in suggesting that the group's mental life might be raised to a higher level by five conditions, namely, continuity of existence, interaction with other groups, a definite structure leading to differentiation of numbers, traditions to regulate inter-group behaviour, and an idea in each individual of the functions of the group. Freud (1921) pointed out that these conditions were, in fact, the means of regaining for the individual his distinctiveness which he had lost on joining the group (i.e. his own continuity, his own self-consciousness, etc.).

Trotter's explanation (1916) of group behaviour was in terms of the herd instinct, but was criticized by Freud (1921), who thought it did not give the leader sufficient emphasis. Freud, therefore, substituted the term "horde" for herd. His definition of a group was "a number of individuals who had substituted one and the same object for their ego ideal, and have consequently identified themselves with one another in their ego."

It is, of course, obvious that McDougall's conditions are present in a group such as the army; but it is less obvious to some what is really their essential nature. If Freud is correct in thinking that this depends on their success in regaining the individual's distinctiveness, then the latter point must always be borne in mind when man-management is being considered. That the soldier is a better soldier if he has some individuality of his own is a view which is in line with the findings of different work quoted above. It is not too much to suggest that its neglect is one of the particular dangers in the East.

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Recently attempts have been made to translate these principles into practical advice. This has been described by several psychiatrists. The issue of outlines of lectures from officers to men (U.S. War Department, 1944) and the papers of Cohen (1944) and Freedman (1944) are examples of what is being done in the United States Army. In the British and Indian Army the subject has been regarded from the onset of the war as of supreme importance (Rees, 1943 and 1944; Main, 1943); but instruction on man-management has been more by local arrangements than by central direction. Nevertheless, psychiatrists may take some credit in the feat of maintaining morale of the vast army training in England between Dunkirk and D-day.

General Surveys of Literature.

Although some of the literature just surveyed deals directly with mental health in the Far East, much of it does not do so. It has, however, been selected deliberately from even more voluminous writings on the grounds that it refers to subjects which are of special significance in the East, and which deserve more direct study.

This may be clearer if a summary is made both of the direct information and of the indirect implications on points of this nature:

(i) A cross-section of psychiatric cases in the East is not the exact counterpart of one taken at home.

(ii) There is more psychosis in the East, mostly due to "schizophrenic" states, but partly to "toxic," partly to "excited" cases.

(iii) There has been a change in the distribution of types of psychoneurosis among British troops in the East in the two wars. In 1914–18 anxiety predominated among officers, hysteria in other ranks. In 1939–45 anxiety was commoner in both. There have also been increasing reports of certain somatic disorders.

(iv) The effects of enemy action have been extensively studied in the West.

(v) Domestic stress has been discussed by only a few writers, but they have done so in challenging terms.

(vi) The importance of physical factors in psychosomatic disorder is still controversial, but the trend of opinion is that the combination of physical and psychological stress is far more serious than either alone.

(vii) The emotional attitude of the individual who is exposed to any environmental stress is supremely important.

(viii) Frustration is significant, especially in staff officers and in base areas.

(ix) Changes in the tempo of activity may act as psychological strain.

(x) There is yet no general agreement about the importance of constitutional factors, nor about the best methods to assess them.

(xi) Faith and war aims are recognized to have a marked effect on mental health by successful soldiers; there are fewer accounts of this by the medical profession.

Conclusions.

This summary of the literature should be considered in conjunction with the summary of observations made earlier in this paper. In this way several points which appear at first sight unconnected take shape as part of a definite pattern.

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Increase of Psychosis.

This increase, in particular in the form of manic states, has been fully discussed elsewhere (Tredgold, 1947), where an explanation was put forward in psychological terms rather than physical. A list of 23 patients was described, most of the affected being of the over-conscientious, responsible type employed on staff work calculated to increase their obsessional tendencies and anxiety. War had produced a sense of urgency; relaxations were more restricted; in staff work and base areas there was no outlet for aggression and little sense of achievement.

It is not too difficult, therefore, to regard this rise in psychosis as an indication that psychological factors are far more widely spread than generally realized, and that they affect far more than those who develop frank psychosis. Information may then be obtained both about a much wider group of psychiatric cases, and about the fluctuations in mental health of those who never report sick. The general interplay of factors which cause breakdown will first be described.

The Interplay of Factors in Individual Breakdown.

The review of literature displayed two main schools of thought—(i) that the essential factor was always an inherent defect of personality, and (ii) that external stress might occasionally overwhelm a normal individual. The work submitted here supports the latter view; but it is agreed, naturally, that in certain cases inherent defects of personality do exist. None of these defects (except dullness) is yet accurately recognized; but more success is likely to be obtained by the study of personality types than by that of psychoneurotic traits. It is thus not a mathematical problem of stress against resistance, but a more complicated one. There are, briefly, three possible explanations why some individuals break under circumstances which others surmount: (*a*) that their general resistance is less, (*b*) that their specific resistance is less, and (*c*) that they are affected at the same time by other adverse factors—or possibly by a lack of favourable ones. Probably each explanation is true in certain cases.

(*a*) Those individuals with little general resistance are those who will break down at the slightest stress. They are of little value as soldiers; their detection is a simple matter; for the machinery of selection catches most, and ensures that they are either discharged from the service forthwith, or employed only on simple duties. They are relatively few.

(*b*) Certain men have a specific failure of resistance, as it might be a chink in their armour. This may be innate, or be due to a wound in the personality's structure—caused by past experience (or a series of experiences), and still present as a tender scar. This has been described by Anderson (quoted above), but to illustrate it may be quoted as a typical case a soldier exposed to severe battle trauma who is given no adequate treatment; he carries with him his psychic scars, but he adapts to various stresses quite successfully till he is again exposed to battle, and immediately breaks down.

This is the explanation, not only why the soldier breaks down under stress which others tolerate, but why the behaviour of his neighbours at the time is

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so important. It may in fact enlarge the chink in his armour by producing further emotional stress. The evidence for this lies in the account of the various emotions associated with physical ailments and leading to psychosomatic disorders. Controlled work on this is most difficult, but the results illustrated by incidence and by case material are very suggestive. The attitude, for instance, of the first medical officer seen, or of the commanding officer, can be paramount in determining whether or no a particular soldier surmounts his difficulties. Indeed it is within the individual experience of most of us how sympathy (or the reverse) "made all the difference." So that it is all the more surprising so little detailed study has taken place on the subject.

It is probably because this aspect of the matter has been neglected that studies of personality traits have produced such inconsistent results. The successes of prediction no doubt are the cases in whom general personality weakness is the determining factor. Their failures perhaps are those where there is a specific, but not obvious, weakness.

(*c*) External coincidental factors may increase the stress by sheer overwhelming effect. This occurred in a number of cases seen and the additional factors were clear enough. There is another point here—that is, the wider influences affecting the group and so each member of it. These are difficult to assess, but should not be forgotten.

Within this framework, however, the mental health of the individual may be seen at the centre of the picture, the point on which many forces converge from all sides. It is fundamental for an understanding of the picture that we should know which forces are the strongest in each case ; it is also an essential preliminary if we are to design measures to maintain the mental health of the future Army—and perhaps of the future society. It is true that the stresses are different for the civilian and the soldier, but they are sometimes comparable. Moreover, as long as conscription exists, the mental health of the young man doing his military service will be of great importance to the welfare of the community.

Measures of Prevention.

The detailed design of measures of prevention is outside the scope of this work, but as the broad principles have been implied in the above discussion they will be summarized here.

If it is accepted that there is an interplay between any especial mental weakness the soldier may have, the stress he meets, and the attitude of others during and just after this stress, this should be looked for in each case, and looked for in terms of its effect on his sense of his own value, and his sense of being appreciated. If these effects happen to be of the same kind, their cumulative weight will be very severe ; but if not, they will constitute only a minor strain for the individual. Whether these three are in fact of the same kind seems at present very much a matter of chance ; but this need not be so, for there is no doubt that the individual's particular weakness can be discovered, and that stress likely to play on it can be predicted. It is also possible to predict the effect of certain emotional attitudes.

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There are thus four lines of approach to the whole question of prevention:

1. The healing of the individual's scars. No doubt this is not easy, but it is possible, and less a problem than one which psychiatrists often undertake quite willingly—that of treating the man whose wounds have not healed at all.

2. The diminution of the effect of external stress by removing its unnecessary exaggerations. Battle inoculation has shown the way here; careful explanation of the facts would prevent much exaggeration of homesickness or of minor physical ailments.

3. The removal of adverse emotional attitudes from men vulnerable to them. This entails instruction of how to treat our fellows rather than of how to treat ourselves, and it is, of course, particularly applicable to the young officer. It is true that, without a long acquaintance with psychology, it would not be easy to teach him how to recognize the presence and type of scars in an individual, but this is unnecessary, for it is possible to lay down certain guidance for his handling of men obviously exposed to external stress.

4. Finally, the improvement of the soldier's general mental health by appealing to those qualities which counter stresses—his faith in his cause, his confidence in his leaders, his sense of his own value, good comradeship, justice and order.

Such work, I submit, would go far to diminish the rate of psychiatric disorder —still alarmingly high in peace and in war—and also to raise the mental health of the Army and community.

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PHYSIOLOGICAL AND PSYCHOLOGICAL RESPONSES TO STRESS IN NEUROTIC PATIENTS.*

By MAXWELL JONES, M.D., M.R.C.P.E., D.P.M.

INTRODUCTION.

AT the beginning of the war part of the Maudsley Hospital moved to Mill Hill School, and a neurosis centre of 550 beds was established. During the six years of war some 20,000 neurotic patients, both forces and civilian, were treated at this centre. Within the centre a special unit for the study of Forces patients with effort syndrome (E.S.) was set up. This unit was in existence from 1939 to 1945, and during this period 2,324 cases of E.S. were treated. The writer was associated with this unit throughout, working in association with a cardiologist (Paul Wood (1)), and with other psychiatrists (Lewis (2), Guttmann (3), Gillespie (4)). Much of the material brought together in this thesis has already been published (Jones (3, 5, 6, 7, 8, 9, 10, 11, 12, 38, 43)). During most of the war years the writer was in receipt of a Medical Research Council grant.

During the first world war Sir Thomas Lewis (13) made a careful study of E.S., and in 1940 he published a revised edition of his monograph ; I would like to quote from the introductory remarks of this edition :

" During the last war sickness referred by medical officers of the Services to disturbances of the cardiovascular system was a chief malady. One such case was numbered for every four cases of wound. Cardiovascular disturbances followed chest complaints as the second largest group of medical ailments ; it comprised in the terminology of the time two chief groups, namely, those invalided for ' disordered action of the heart ' (D.A.H.), and those invalided for ' valvular disease of the heart ' (V.D.H.). ' Irritable heart,' an earlier term than ' disordered action of the heart,' dates from Da Costa and the American Civil War. Da Costa believed that it led up to enlargement and failure of the heart ; but time has not endorsed his view. What he described was not a disease, but a series of symptoms found in many different states. Their reference to the heart is a grave objection to each term, for it maintains among those who use it the presumption that there is a cardiac malady, and among patients each awakens serious apprehension. Because these designations were impracticable from these standpoints, and because they implied a disease, rather than a syndrome, I discarded them during the last war and introduced the more appropriate and less committal term ' effort syndrome ' ; the term was universally adopted in this country and is still in general use. The condition to which it refers forms the chief subject matter of this book.

" The magnitude of the problems presented by this condition, from the standpoints of army wages, invalidism, and pensioning, will be realized when it is known that not less than 70,000 soldiers had reported sick and were classed as cardiovascular by the summer of 1918 ; and 44,000 cases of ' effort syndrome ' became pensioners. Actually, no more than one out of six of these soldiers suffered from disease of the heart ; the rest were ' effort syndrome ' cases. The problem is the same in this war as in the last ; and, if this war continues as the last did, it will not be of much less magnitude than it was in that."

* An M. D. Thesis awarded a Gold Medal at the University of Edinburgh.

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Lewis considered the etiology of E.S. to be partly physical (mainly following infections), and partly constitutional (poor physique, nervous temperament, etc.), but although admitting the importance of psychological factors he did not stress these—to quote (p. 13):

"In my view (such) nervous symptoms are not to be regarded as parts of the 'effort syndrome.' They are certainly not essential to it, for most cases are without them; they are added to the syndrome, and are of sufficient frequence to leaven the whole group. A matter more relevant to the present discussion is to know if the symptoms properly belonging to the 'effort syndrome,' namely, persistently increased heart rate and blood pressure, and exaggerated breathlessness on effort, can arise directly out of anxiety states; it seems probable that they can, and that abnormal anxiety must be regarded as a real and important contributing cause in given patients."

Physiological studies by Lewis and his collaborators (16, 17, 18), by Haldane and his associates (19, 20, 21) and by Briggs (22) demonstrated clearly that E.S. patients responded poorly to exercise, and showed various physiological anomalies, but the etiology of the condition still remained obscure.

Between the two wars little was done to study the problem, but in 1937 Hick *et al.* (24) brought forward impressive evidence in support of Haldane's earlier suggestion that the symptoms of E.S. were due to anoxaemia of effort, and in 1938 Soley and Shock (23) suggested that the symptoms of E.S. were due to hyperventilation alkalosis.

When we started to study the problem of E.S. there were two main schools of thought, the cardiologists (Lewis (13), Parkinson (14), White (15)), who still felt that the etiology of E.S. when not due to definite organic factors was unknown, and the psychiatrists, who were inclined to deny the existence of E.S. as an entity, and thought of it as a particular form of anxiety state. The cardiologist's point of view is well expressed by Parkinson (14). Speaking of E.S. he states:

"Its true nature is not yet known, but the full picture which bulks in war is only sporadically encountered in peace-time. Tentatively, I would define Effort Syndrome as a functional circulatory disease, most evident on exertion, unmasked or produced by war service. It is hoped that the experience of this war will provide a better name, a more satisfactory definition, and a clearer understanding of this condition." . . . "In the present war, conditions so far seem to have produced a preponderance of the psychoneurotic type, and a greater proportion of those who had similar symptoms in civil life. Indeed, some current opinion is inclined to the view that effort syndrome is simply a psychoneurosis. It is not certain how far this definition will carry us, because the term can be so readily applied to any form of ill-health which is imperfectly understood and unaccompanied by organic signs. After all, psychological variations and faults in healthy people are common enough. It could only be a bar to medical progress if psychoneurosis (or psycho-somatic disease) remained a label and became a dumping ground for most unexplained illness, much as did 'Neurasthenia' in the past. It is still to be decided how far psychotherapy is rational and effective treatment; besides, an explanation for the predominance of circulatory symptoms, the relation to effort, and the relative uniformity of the clinical picture is not yet forthcoming. Certainly the time is ripe not only for psychological but for other investigations, as it would appear that autonomic, nervous, endocrine, respiratory and metabolic factors may also operate in effort syndrome, and will also engage the attention of the physician seeking a wider conception of its essential features. Doubtless this expanded approach has much to commend it, and will deepen and broaden our vision of what is at present obscure in the rationale of Effort Syndrome."

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The E.S. unit at Mill Hill started at the end of 1939 with a psychiatrist and a cardiologist working in collaboration. We had no fixed view-point, although each worker naturally approached the problem in a somewhat different manner, determined partly by his own personality and training. The cardiologist (Paul Wood) remained with us for eighteen months, at the end of which time he had decided that the problem was a psychiatric and not a cardiological one. In his Goulstonian lectures (1) he stated :

" It is urged that the diagnosis of ' effort syndrome ' be dropped; a proper psychiatric diagnosis is nearly always available ; if attention is called to the presence of effort intolerance, let effort intolerance be added in brackets."

From the psychiatric point of view there was no advantage in retaining the diagnosis of effort syndrome, and as the war progressed the number of cases sent into Mill Hill by the army psychiatrists with this diagnosis progressively diminished—732 in 1940 ; 650 in 1941 ; 531 in 1942 ; 220 in 1943 ; 99 in 1944. There was no reason to suppose that the syndrome had become less frequent, but presumably familiar psychiatric diagnoses were being used instead.

The growing realization that E.S. was not an entity did not diminish our interest in the subject of effort intolerance, or in the various anomalies of vegetative function found in these cases. It was still far from clear what the effort intolerance was due to, or how this disability could be measured objectively (if indeed it was present at all).

This thesis is concerned mainly with a study of some of the physiological functions of neurotic cases with effort intolerance. It is convenient for research purposes to retain the use of the term " effort syndrome " (E.S.) to indicate cases with effort intolerance as distinct from other types of neuroses—the alternative would have been to use the psychiatric diagnosis and add " with effort intolerance " in brackets.

The term effort syndrome, as used here, refers to a relatively excessive response to effort as manifested by breathlessness, palpitation, and subjective feeling of fatigue on even mild exercise, along with excessive vegetative lability on emotional excitement, e.g. sweating, palpitation, giddiness, etc., as described by the patient or objectively observed. If there is a known organic cause then that diagnosis is, of course, used in preference to the term effort syndrome. " Syndrome " is a descriptive term generally used to avoid premature aetiological conception ; there is apparently no common aetiology to E.S. ; and as a descriptive term is generally favoured, the American preference for the term " neurocirculatory asthenia " seems reasonable.

In the majority of E.S. patients seen here, constitutional (including personality) factors would appear to be more important than psychogenic factors ; thus when a breakdown occurs there may be no pronounced affective disorder, and no adequate psychopathology to explain the illness. From this it follows that existing psychiatric classifications, based on aetiological or descriptive grounds, would be difficult to apply. It therefore seems reasonable to use a classification which takes into account constitution and personality more fully than do existing classifications. One can divide the E.S. material into three broad groups :

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(1) Where the poor physical endowment is the primary factor in producing symptoms. Here we are simply dealing with a poor machine, which shows excessive response to physical effort. Here the patient has effort intolerance which has been present since earliest recollection.

(2) As above, but the patient responds in a neurotic manner to his constitutional inferiority. In this sense there is a psychological aetiology, but the constitutional factor is the basic one. The emotional reaction may take any form, depending on the personality, and may simply amount to displeasure. Here the patient feels that he has an effort intolerance, but his disability may actually be less than he believes it to be. Such patients usually give a history of effort intolerance since childhood, but the mere disability of Group 1 frequently changes under stress to the neurotic attitude of Group 2.

(3) Primarily neurotic. Here the usual aetiological factors determining a neurosis will apply. The form may be determined by the constitutional physical inferiority which, if present, colours the whole picture, but is of only secondary importance; or it may be wholly psychogenically determined. Such "illness" tends in our experience to be of comparatively recent origin, and is particularly prone to result from the emotional and physical stresses of wartime.

By neurosis is meant an upset of the normal harmonious functioning of the mind and body resulting from some personal inadequacy to meet a psychological situation or problem. Poor general health, weak physical constitution, low intelligence, etc., may predispose to such a neurosis, but these are in themselves not enough; the individual has failed to meet the demands of his environment or of his conscience, and a conflict has been set up. Thus, the Group 1 E.S. has the symptomatology of the other two groups, but his physical limitation has been satisfactorily met and presents no handicap, so he has no neurosis. The opposite is true of Group 2 E.S.

This division into three groups of E.S. proved convenient, but unfortunately only an occasional group 1 E.S. was seen (from the definition it is clear that they would only be discovered when examining a large random sample of controls because they do not regard themselves as ill, and therefore would not report sick), and no detailed study of this group has been possible.

Problems Studied in this Thesis.

1. Had the E.S. patients a poor exercise response compared with a normal control group? Judged by the subjective accounts of E.S. patients there was a real disability, but could this be assessed objectively?

2. What method or methods were most suitable for demonstrating objectively this disability (if present)?

3. As E.S. was not a psychiatric entity, it was important to compare neurotic patients showing poor exercise response with other neurotic patients not complaining of this disability. Poor exercise response might be closely correlated with neuroses showing anomalies of vegetative function—e.g. somatic anxiety symptoms—or might be an attribute of neuroticism in general.

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4. How important was the subjective attitude to physical work in the E.S. patient? Does he in fact have any effort phobia?

5. How did E.S. and other neurotic patients respond to stresses other than physical exercise—e.g. cold, pain, emotional excitement, and persistence?

6. As the ultimate aim of all research in medicine must be the benefit of the patient, how did the facts elicited influence the treatment of poor exercise response in neurotic patients, and of certain other types of neurotic patients not complaining of effort intolerance?

(As most of the statistics worked out in this thesis are based on small samples (20 or less) we have regarded $P < 0.01$ as significant and $P < 0.05$ as probably significant.)

Response to Stress.

1. Exercise Response.

Under this heading are included four different degrees of stress:

(*a*) *Standard work*, which represents moderately hard work (6,750 ft.lb. of work per min.).

(*b*) *Maximal work*, which means working to complete exhaustion.

(*c*) *Light work* (4,500 ft.lb. of work per min.).

(*d*) *Minimal work*.—Virtually no work being done by the subject.

(*a*) Standard Work.

An ergometer was made by adapting an old bicycle and fracture bed (see Fig. 1).

The ergometer consisted of a bicycle chain wheel and pedals connected by the frame to the ground wheel, which had a friction band with weights and a

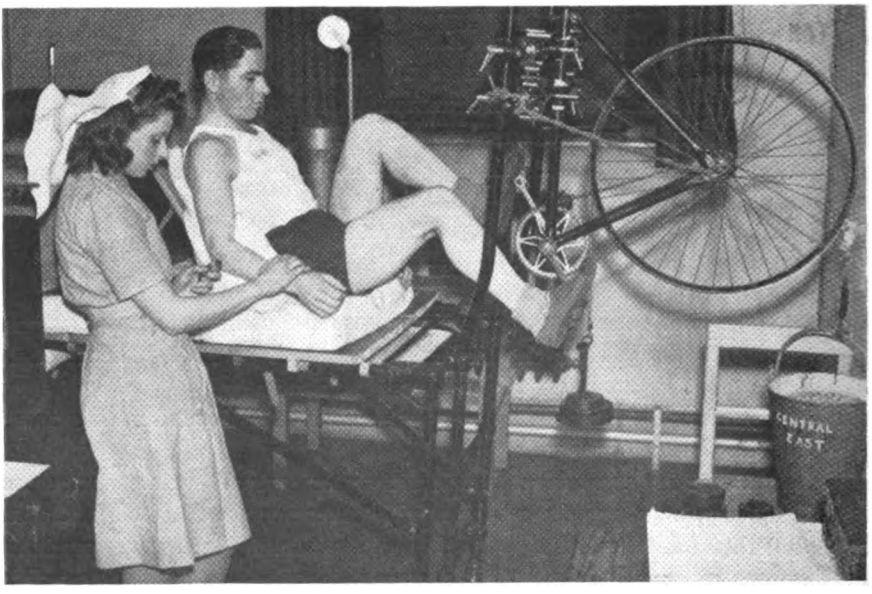

Fig. 1.—Showing bicycle ergometer and position adopted when cycling.

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spring balance. The whole was supported by two uprights off the end of the bed so that the subject could pedal as he lay on the bed ; though unorthodox the position was comfortable, and facilitated the collection of blood samples. We have used a standard exercise throughout, pedalling at 42 revolutions per minute, the friction of the brake band being equivalent to a weight of 9 lb., and the subject doing 6,750 ft.lb. of work per minute for five minutes. In deciding on the amount of work to be done for the standard exercise we chose the heaviest work which could be done satisfactorily by the worst of the E.S. material.

1. *Pulse Response to Standard Work.*

Material.—For this study we used a random sample of 20 healthy men from a nearby barracks. They were all tradesmen (fitters), and in good health at the time of testing. None had a past history of serious illness affecting the respiratory or circulatory systems. Each had a short interview with the psychiatrist and none showed any evidence of frank neurosis. Their weights ranged from 120 to 154 lb. with a mean of 143·4 lb. Their ages ranged from 18 to 35 with a mean of 24·7.

Ten patients with a characteristic history of E.S. and 10 patients with anxiety states and somatic anxiety symptoms but no complaint of poor exercise response were chosen. Six of the E.S. patients described effort intolerance and symptoms of excessive vegetative lability on excitement since childhood (Group 2 E.S.). In the remaining four E.S. patients their symptoms dated from recent years—during army service (Group 3 E.S.). All 20 patients were free from any demonstrable organic disease, and had no history of serious respiratory or circulatory illness at any time in their lives. The E.S. patients' weights ranged from 132 to 164 lb. with a mean of 143·6 lb., and their ages ranged from 24 to 36 with a mean of 29. The comparable figures for the anxiety states were 133 to 161 lb. with a mean of 143·9 lb., and 23 to 36 with a mean of 30 years.

The controls, being craftsmen, were leading relatively sedentary lives, and had less physical training, marching, etc., than the patients.

Method.—Standard work on the bicycle ergometer was used. The subjects did the tests on three successive days before any recorded test was made. Many attempts have been made to devise a reliable test of physical efficiency from the pulse response after exercise. This method, however, can never be very accurate, as cardiac rate is only one factor which determines cardiac output, the latter being what one would really like to measure. However, after moderate or severe physical exercise, a characteristic curve is obtained in which the major pulse decrement occurs within the first four minutes, and then flattens out rapidly.

Our procedure has been to count the pulse rate for a full minute for the ten successive minutes immediately following the cessation of exercise. The test was always repeated on successive days. Much trouble was taken to ensure standard conditions, and if necessary the subject rested more than 30 minutes before starting exercise if there was any difficulty in obtaining a constant resting pulse rate. Table I shows the re-test reliability (rank corre-

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lation) of various ways of expressing the pulse response to standard work on successive days. The E.S. patients and anxiety states are taken together as one group of 20. It will be seen that the resting pulse and peak pulse (for the minutes immediately after the cessation of exercise) correlate better in the E.S. plus anxiety groups (resting $\rho = 0{\cdot}813 \pm {\cdot}076$ SE; peak $\rho = 0{\cdot}724 \pm {\cdot}103$ SE) than in the controls (resting $\rho = 0{\cdot}605 \pm {\cdot}142$ SE; peak $\rho = 0{\cdot}512 \pm {\cdot}165$ SE).

Of the various ways of expressing the pulse figures shown in Table I no one method gives an outstandingly high correlation in both controls and E.S. plus anxiety states. We have paid more attention to one method which we have called the "Pulse Area" than the other methods available because it takes more account of the physiological changes occurring throughout the recovery period. It is obtained by adding the pulse figure for the first four minutes after the cessation of exercise, and the mean of the last three minutes counted (8, 9, and 10 minutes) and subtracting five times the resting pulse (see Table I, Method 6). We have used it for some years now, and believe it to be the most accurate method of expressing the pulse response to moderate exercise.

TABLE I.—*Coefficient of Correlation for Pulse Response (Treated in Various Ways) to Standard Work, Performed on Two Successive Days.*

	20 normal controls.		20 E.S. + anxiety states.	
	Correlation coefficient.	Standard error.	Correlation coefficient.	Standard error.
1. Resting pulse	0·605	·142	0·813	·076
2. First minute post exercise	0·512	·165	0·724	·103
3. Second minute post exercise	0·536	·159	0·691	·117
4. Third minute post exercise	0·514	·165	0·692	·117
5. Resting pulse minus first minute post exercise	0·382	·191	0·564	·153
6. 1, 2, 3, 4, 9 minutes minus resting pulse × 5	0·665	·125	0·512	·165
7. 1, 2, 3, 4, 9 minutes minus resting pulse	0·581	·148	0·550	·156
8. 1, 9 minutes minus resting pulse × 2	0·512	·165	0·462	·175
9. 1, 2, 3, 4, 9 minutes post exercise	0·562	·153	0·667	·124

Results.—Fig. 2 shows graphically the pulse response of the various groups to standard work. All figures represent the mean of two tests done on successive days. For the 20 normal controls, the mean resting pulse was 67, and the mean pulse figures for the first four minutes after standard work were 100, 82, 81, 79. The means of the eighth, ninth and tenth after exercise were added together and averaged, the figure obtained being 76. The corresponding figures obtained for the 10 E.S. patients were 73, 121, 106, 100, 95, and 85, and for the 10 anxiety states, 72, 110, 97, 91, 88, and 84. Fig. 2 shows how, when the results are plotted, the curves of the three groups are almost parallel. The greater pulse rise immediately after exercise in the E.S. patients and anxiety states compared with the controls are maintained, and result in a much slower decrement.

The "Pulse Area" (see Method) is probably the best method for quantitating the pulse figures after standard work. It is obtained by adding the

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five pulse figures—the first four minutes after exercise and the mean of the eighth, ninth, and tenth minutes—and subtracting five times the resting pulse. The difference between the controls and E.S. patients for the mean pulse area is significant (critical ratio (c.r.) 4·4 ; P < ·01). The mean pulse area for the controls is 85·35 ± 36·0 s.d., while that for the 10 E.S. patients is 150·7 ± 36·73 s.d. The difference between controls and the 10 anxiety states is less marked (c.r. 2·08 ; P < ·05). The mean pulse area for the anxiety states was 116·45 ± 34·7 s.d. Comparing the controls with the 10 E.S. patients plus the 10 anxiety states, significant difference is again obtained (c.r. 3·95 ; P < ·01), the mean pulse area for the 20 patients being 135 ± 40·69 s.d.

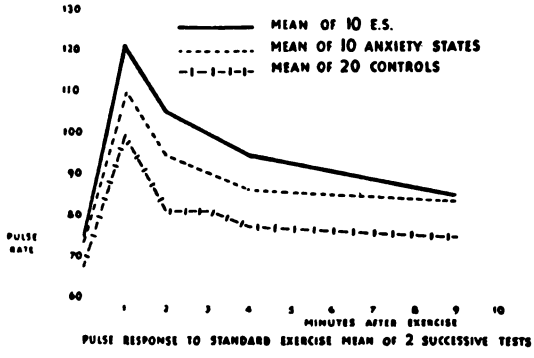
MEAN OF 10 E.S.
MEAN OF 10 ANXIETY STATES
MEAN OF 20 CONTROLS
PULSE RATE
MINUTES AFTER EXERCISE
PULSE RESPONSE TO STANDARD EXERCISE MEAN OF 2 SUCCESSIVE TESTS

FIG. 2.

The above group of 20 normal controls, 10 anxiety states with somatic symptoms but no complaint of effort intolerance and 10 E.S. patients, were enlarged to form a group of 12 Group 2 effort syndromes (i.e., cases with a lifelong history of poor exercise response and excessive vegetative lability on excitement) : 15 Group 3 effort syndromes (i.e. patients whose effort intolerance has developed as part of a neurosis, in contrast to the more "constitutional" Group 2 effort syndrome) ; 10 patients with mild anxiety states of a chronic nature who had no somatic anxiety symptoms, and no complaint of effort intolerance ; 12 cases with conversion hysteria of the more chronic type with no clinical evidence of anxiety.

TABLE II.—*Significance of the Difference of the Means in Pulse Area Between the Normal Control Group and Five Different Groups of Neurotic Patients for Five Minutes Immediately Post (Standard) Exercise.*

	Mean pulse area.	S.D.	C.R.	P.
20 normal controls	86	35·8	—	—
12 E.S. Group 2	145	30·6	4·9	<0·01
15 E.S. Group 3	150	66·3	3·3	<0·01
10 somatic anxiety	116	34·7	2·1	<0·03
12 hysterics	100	30·5	1·1	<0·15
10 anxiety states	166	33·2	5·8	<0·01
Total 59 neurotics	136	42·7	5·0	<0·01

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Results.

Pulse Area.—As will be seen from Table II, the group of hysterics (c.r. 1·1 ; P $<$ 0·1), does not appear to differ significantly from the normal controls. The most striking differences are found in the anxiety states (c.r. 5·8 ; P $<$ ·01), and in the E.S. Group 2 (c.r. 4·9 ; P $<$ ·01). The mean pulse area for the 20 controls was 86 $\pm$ 35·8 s.d., and for the total 59 neurotic patients 136 $\pm$ 42·7 s.d. (c.r. 5·0 ; P $<$ ·01).

2. Metabolic Response to Standard Work.

The choice of method for measuring the metabolic increase brought about by exercise presents very great difficulties. Knipping (26) believes that the most satisfactory technique is to use a spirometer to which O_2 is added at the rate sufficient to keep the level of the spirometer constant. The rate of O_2 inflow into the closed circuit then equals the O_2 consumption. He increases the work load progressively until the maximum rate of O_2 intake is reached : this value is reached after two or three minutes and the work is interrupted after another two or three minutes. We experimented with this technique but were unable to have a satisfactory apparatus built in wartime, and in any case, when using an improvised machine, found that it was unsatisfactory to have neurotic patients breathing into a closed circuit during exercise.

Ideally, one would like to compare the efficiency of muscular work in the three groups we have studied. Simonson and Enzer (27) in their excellent review of the physiology of muscular exercise and fatigue in disease discuss the whole problem adequately. The " coefficient of efficiency " $\frac{W}{Ew-R}$ (W = amount of work done ; Ew = the total energy expenditure ; R = the energy expenditure during rest) may be determined by two methods : (*a*) by measuring the excess energy expenditure from the beginning of the work until the end of recovery and relating it to the total amount of work done ; (*b*) by allowing the subject to exercise until a steady state is reached (after three to five minutes of exercise, when the body " pays as it goes," and no further oxygen debt is incurred—i.e. anaerobic and aerobic processes are balanced), and then measuring the excess oxygen uptake per minute during this state and relating it to the amount of work done per minute. However, neither of these methods was suitable for our purpose : first, because to keep a mouthpiece and nose clip in position continually during the five minutes' standard exercise, and for a further ten to twenty minutes post exercise, would be impracticable with neurotic subjects ; second, because the standard exercise used was too heavy to allow a steady state to develop in most of the patients. Finally, the possibility of measuring the entire oxygen debt was given up mainly because of the difficulty in deciding when the oxygen uptake had fallen to the resting metabolic rate. We have measured the O_2 uptake for only five minutes post exercise, by which time, of course, the oxygen debt had not been fully repaid ; however, the oxygen consumption decreases abruptly during the beginning of recovery, and by far the major portion of the decrease has occurred within the first five minutes post exercise, only a negligible decrease

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occurring during the next five minutes. This is illustrated by the following mean figures of O_2 uptake per minute obtained for 3 E.S. patients doing standard work : resting 288 c.c., two to three minutes from start of exercise 1,529 c.c. ; four to five minutes from start of exercise 1,824 c.c. ; one to two minutes post exercise 1,439 c.c. ; four to five minutes post exercise 431 c.c. ; nine to ten minutes post exercise 399 c.c. We fully realize that taking only this five minutes post exercise period is open to criticism, but believe that by attempting a more exact (and exacting) technique with neurotics we would have defeated our own purpose by increasing the risk of provoking emotional reactions.

For the actual test the patient was rested for half an hour before exercising.

The subject then cycled for five minutes as above, and 15 seconds before the completion of exercise the mouthpiece of the Douglas bag was inserted and a nose clip applied. At the completion of the five minutes' cycling the tap leading into the Douglas bag was opened, and the expired air collected for the five minutes immediately post exercise. Two Douglas bags connected by a three-way tap were used, and expired air collected in one bag for the first 90 seconds, and collected in the other bag for the remaining three and a half minutes. During this five minutes post exercise period the respirations per minute were counted. The whole procedure was carried out in detail for four consecutive days prior to testing in order to familiarize the subject with the method.

The Douglas bags were well shaken to ensure mixing of the expired air, and a sample of each bag was withdrawn through a Brodie Gas Sampler. Duplicate samples from each gas sampler were analysed in a Haldane Gas analyser. These duplicate determinations agreed within 0·04 per cent. for O_2 and 0·03 per cent. for CO_2. Frequent analyses were made on atmospheric air, checking 20·94 for the combined CO_2, and O_2 determinations within 0·03 per cent. The mercury levelling bulb on the Haldane analyser had an automatic lowering and raising device run by a small motor.

For 20 subjects the complete test was repeated on three successive occasions to establish the reliability of the method. The intercorrelation of the three means gave a reliability for the O_2 consumption, $\gamma = 0{\cdot}75$. These figures indicated that the reliability of repeated testing of the same subject with O_2 assays was sufficiently good to justify only one test being performed. This meant a great economy of time.

Material.—The subjects used for this study were the same as the first group tested for pulse response to standard work.

Results.

Oxygen uptake after standard exercise.—Fig. 3 shows the O_2 uptake after exercise for the three groups, 20 normal controls, 10 E.S. patients and 10 anxiety states. The volumes represent the mean O_2 uptake per minute for the five minutes post exercise during which the expired air was collected in the Douglas Bags. Obviously the O_2 uptake during these five minutes is rapidly falling as the O_2 debt is repaid, but for comparative purposes the mean O_2 uptake per minute is the most convenient to use. Table III gives the same results in more detail. The volumes given for the normal controls

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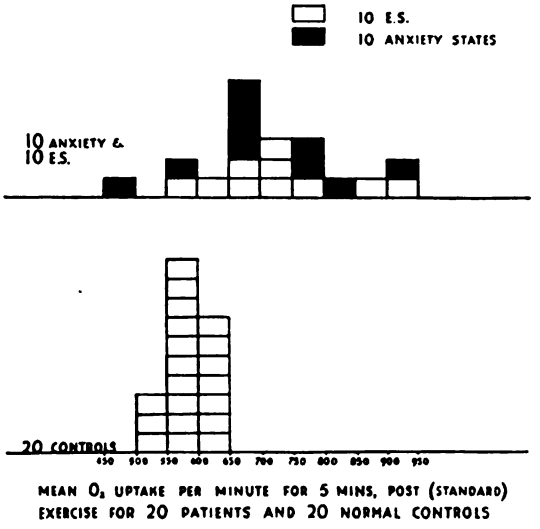
10 E.S.
10 ANXIETY STATES
10 ANXIETY & 10 E.S.
20 CONTROLS
450 500 550 600 650 700 750 800 850 900 950
MEAN O₂ UPTAKE PER MINUTE FOR 5 MINS. POST (STANDARD) EXERCISE FOR 20 PATIENTS AND 20 NORMAL CONTROLS

FIG. 3.

are obtained from a single test; those from the patients are the mean of three tests done on successive days.

TABLE III.—*O_2 Uptake in Cubic Centimetres Per Minute after Standard Work.*

	Range.	Mean.	S.D.
20 normal controls . . .	533 to 638	586	35·9
10 E.S. patients . . .	581 to 923	729	109·0
10 anxiety states . . .	470 to 901	702	126·0
10 E.S. + 10 anxiety states	470 to 923	716	118·2

The mean O_2 uptake per minute for the 20 controls is 586 c.c. ± 35·9 s.d. (range 533 to 638). The mean of the 10 E.S. patients is 729 ± 109·0 s.d. (range 581 to 923), and for the anxiety states 702 ± 126·0 s.d. (range 470 to 901). When the E.S. patients and anxiety states are added together, the mean O_2 uptake is 716 ± 118·2 s.d. (range 470 to 923).

The difference between the E.S. patients and the normal controls is significant (c.r. 3·83; $P < ·01$), and probably significant for the difference between anxiety states and controls (c.r. 2·53; $P < ·02$). The difference between E.S. patients plus anxiety states and controls is significant (c.r. 4·58; $P < ·01$).

When the above group of 20 normal controls and 10 E.S. + 10 anxiety states was enlarged to include other groups of neurotics as described under pulse response to standard work, the following results were obtained:

Table IV shows the mean oxygen uptake for the five minutes post exercise in the normal controls and five neurotic groups tested. It will be seen that all five groups of neurotics show a significantly greater oxygen uptake per minute than do the normal controls. The difference is most marked in Group 3 E.S. (c.r. 4·2; $P < ·01$), and in the E.S. Group 2 (c.r. 4·2; $P < ·01$), and

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TABLE IV.—*Significance of the Difference of the Means in Oxygen Uptake Between the Normal Control Group and Five Different Groups of Neurotic Patients for Five Minutes Immediately Post (Standard) Exercise.*

	Oxygen uptake.			
	c.c.'s per minute.	S.D.	C.R.	P.
20 normal controls	586	35·9	—	—
12 E.S. Group 2	718	101·1	4·2	< ·01
15 E.S. Group 3	673	70·5	4·2	< ·01
10 somatic anxiety	703	126·0	2·7	< ·02
12 hysterics	654	51·5	3·9	< ·01
10 anxiety states	683	84·0	3·3	< ·01
Total 59 neurotics	685	86·2	7·1	< ·01

least striking in the somatic anxiety group (c.r. 2·7 ; P < ·02). The mean oxygen uptake for the 20 controls is 586 c.c. per minute ± 35·9 s.d., and for the total 59 neurotic patients 685 c.c. per minute ± 86·2 s.d. (c.r. 7·1).

3. *Lactate Rise after Standard Work.*

Method.—Standard work on a bicycle ergometer was carried out as previously described. A sample of venous blood was removed for lactate determination.

(*a*) While the subject was resting and (*b*) ten minutes after completion of the standard exercise.

The blood samples were analysed for lactate content, the ten-minute sample representing the time when the lactate was probably at its peak. There is a lag in the disappearance of lactate after exercise, which in the trained subject may last for six to eight minutes, but in the untrained or non-athletic subject may last two or three times as long (28).

The blood samples were drawn into tubes containing a small amount of mixture of potassium oxalate and sodium fluoride ground up together in the proportion of 1 : 10. The latter was to prevent the lactic acid from decomposing. Determinations were made in duplicate following Friedmann's method (29). The treatment of the filtrate with $CuSO_4$ and $Ca(OH)_2$ was omitted as suggested for normal human blood (29). The oxidizing agent used in the aeration procedure was N/10 $KMnO_4$. Acceptable determinations had blanks of not more than 0·1 c.c. of 0·002N. I_2 and the duplicates agreed within 0·05 c.c. of 0·002N. I_2.

In testing the E.S. patients and the anxiety states, the complete test was repeated on three successive occasions to establish the reliability of the method. The intercorrelation of the three means for the lactate rise gave a reliability $\gamma = 0{\cdot}96$. These figures indicated that the reliability of repeated testing of the same subject with lactate assays was sufficiently good to justify only one test being performed.

Using the same 20 normal controls 10 E.S. and 10 anxiety states previously

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described under pulse response and metabolic response to standard work the following results were obtained:

TABLE V.—*Blood Lactate Rise Above the Resting Level Following Standard Work, Expressed in Milligrammes Per Cent.*

	Range.	Mean.	S.D.
20 normal controls	3 to 22	11·1	6·3
10 E.S. patients	8 to 35	21·4	8·6
10 anxiety states	0 to 27	15·9	7·8
10 E.S. and 10 anxiety states	0 to 35	18·6	8·4

Results.—Table V gives the blood lactate rise after exercise in the three groups—controls, anxiety states and E.S. patients. The 20 controls gave a mean lactate rise of 11·1 mgm. per cent. ± 6·3 s.d., the 10 E.S. patients a mean lactate rise of 21·4 mgm. per cent. ± 8·6 s.d., the 10 anxiety states a mean lactate rise of 15·9 mgm. per cent. ± 7·8 s.d., and the 10 E.S. patients plus 10 anxiety states a mean lactate rise of 18·6 mgm. per cent. ± 8·4 s.d.

The difference between the controls and the E.S. patients (c.r. 3·12; $P < ·01$), and the controls and E.S. patients plus anxiety states (c.r. 3·32; $P < ·01$) is significant, but the comparison between the controls and the anxiety states is not significant (c.r. 1·64; $P < 0·1$). Of the 10 E.S. patients, 6 had a lactate rise greater than the highest control rise (22 mgm. per cent.), while only one of the anxiety states showed a rise above this figure.

When the above groups are enlarged to include larger groups of neurotic patients the following results are obtained:

TABLE VI.—*Significance of the Difference of the Means in Lactate Rise Between the Normal Control Group and Five Different Groups of Neurotic Patients for Five Minutes Immediately after (Standard) Exercise.*

	Lactate rise.			
	Mgm. %	S.D.	C.R.	P.
20 normal controls	11·1	6·2	—	—
12 E.S. Group 2	18·0	6·9	2·8	$< ·01$
15 E.S. Group 3	19·9	8·8	3·1	$< ·01$
10 somatic anxiety	15·8	7·8	1·6	$< ·1$
12 hysterics	15·0	6·2	1·6	$< ·1$
10 anxiety states	19·2	7·4	2·8	$< ·01$
Total 59 neurotics	17·7	7·7	3·8	$< ·01$

Table VI shows the mean lactate rise following standard exercise. Both groups of E.S. show significant differences (E.S. Group 3, c.r. 3·1; $P < ·01$, E.S. Group 2, c.r. 2·8; $P < ·01$), and the anxiety states are also significantly different (c.r. 2·8; $P < ·01$). The somatic anxiety states (c.r. 1·6; $P < ·1$) and the hysterics (c.r. 1·6; $P < ·1$) do not appear to be significantly different from the normal controls. The mean lactate rise for the 20 controls is 11·1 mgm.

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per cent. ± 6·2 s.d., and for the total 59 neurotic patients 17·7 mgm. per cent. ± 17·1 (c.r. 3·8).

4. *Ventilation after Standard Work.*

TABLE VII.—*Ventilation Responses for the Five Minutes Immediately Following Standard Work. By Oxygen Equivalent is meant the Amount of Ventilation Required for the Assimilation of* 100 *c.c. of Oxygen.*

	Breaths per minute.	Litres per minute.	O_2 uptake per minute. (c.c.'s.)	Oxygen equivalent.	O_2 uptake per breath. (c.c.'s.)	Volume per breath. (c.c.'s.)
20 controls	18·3	17·0	586	2·901	34·1	929
10 E.S. patients	30·6	30·5	729	4·184	26·0	996
10 anxiety states	26·7	26·0	702	3·704	31·6	974
E.S. plus anxiety states.	28·7	28·3	716	3·944	28·8	985

Table VII shows the essential factors regarding the post exercise ventilation in the patients and controls. It will be seen that for the five minutes post exercise, the mean respiratory rate per minute was 18·3 for the controls, 30·6 for the E.S. patients, and 26·7 for the anxiety states. The mean ventilation in litres per minute for the three groups was 17·0 l, 30·5 l, and 26·0 l respectively. As the mean oxygen uptake per minute for the three groups was 586 c.c., 729 c.c., and 702 c.c. respectively, the post exercise oxygen equivalent (i.e. the ventilation required for the assimilation of 100 c.c. of oxygen) was 2·9 for the controls, 4·2 for the E.S. patients, and 3·7 for the anxiety states. The oxygen uptake per breath was 34·1 c.c., 26·0 c.c., and 31·6 c.c. respectively for the three groups, and the volume per breath 929 c.c., 996 c.c., and 974 c.c. respectively in the controls, E.S. patients, and anxiety states.

TABLE VIII.—*Significance of the Difference between the Means (c.r.) of Pulse Area, Blood Lactate Rise and Metabolic Response to Standard Work by Various Groups of Neurotic Subjects, Compared with a Control Group of* 20 *Normal Subjects.*

	Pulse area.		Lactate rise.		O_2 uptake.	
	C.R.	P.	C.R.	P.	C.R.	P.
12 E.S. Group 2	4·9	< ·01	2·8	< ·01	4·2	< ·01
15 E.S. Group 3	3·3	< ·01	3·1	< 0·1	4·2	< ·01
10 somatic anxiety	2·1	< ·04	1·6	< ·1	2·7	< ·02
12 hysterics	1·1	< ·1	1·6	< ·1	3·9	< ·01
10 chronic anxiety	5·8	< ·01	2·8	< ·01	3·3	< ·01
Total 59 neurotics	5·0	< ·01	3·8	< ·01	7·1	< ·01

Discussion on the Response to Standard Work.

From the results obtained (Table VIII) it is clear that a significant differentiation between the exercise response of normal controls and E.S. patients (both Group 2 and Group 3) can be made in the three tests—pulse area, O_2 uptake, and lactate rise. There is also a significant differentiation on all

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three tests between the controls and the chronic anxiety states who had no somatic anxiety symptoms and made no complaint of poor exercise response. The difference between the controls and somatic anxiety states on the same three tests is probably significant, except in the case of the lactate rise—(c.r. 1·64 ; P $<$ ·1). The somatic anxiety states had symptoms similar to those complained of by the E.S. patients, and apparently due to autonomic over-activity ; the chronic anxiety states, on the other hand, had no such symptoms, although these had been present in the more acute stage of their illnesses ; nevertheless the E.S. patients and chronic anxiety states showed poorer exercise response in our tests than did the somatic anxiety states. This suggests that autonomic overactivity alone was not responsible for poor exercise response. The group of hysterics approximated more to the control group, but the total group of 59 neurotics was sharply differentiated from the control group on all three tests.

Post-exercise ventilation showed no evidence of deficient ventilation ; the volume per breath was approximately equal in the controls, E.S. patients, and anxiety states, but in both groups of patients more ventilation was necessary for the assimilation of 100 c.c. of oxygen than in the controls. In other words, the patients breathed less efficiently than the controls.

(*b*) Maximal Work.

The bicycle ergometer as already described was used.

The procedure was similar to that adopted for the standard work experiments except that the subject was now asked to work to complete exhaustion, and an attempt was made to achieve this within ten minutes by choosing a suitable weight to start with, and if necessary adding further weights while the patient was actually pedalling. In view of the fact that no standard weight was used, no comparison of the amount of work done by the various subjects was possible. Actually, the E.S. patients, in the large majority of cases, reached their end-point within the ten-minute period when doing work equivalent to 6,750 ft.lb. per minute, i.e. the same work level as was used for the standard work. The controls invariably needed considerably more weight on the friction band.

It is fully realized that the " end-point " must be an arbitrary one, dependent at least as much on psychological factors as on the physiological changes occurring as a result of physical work. All that can be said is that the conditions were standardized, and every encouragement given to the subject to produce his best performance.

Twenty normal controls and 20 E.S. patients (8 Group 3 and 12 Group 2) were tested.

1. *Pulse Response to Maximal Work.*

The mean pulse rates for the resting pulse, the first four minutes after exercise, and the average of the eight to ten-minutes period following maximal work were as follows : controls, 70, 156, 131, 119, 113, and 104 ; patients, 71, 154, 134, 125, 119, and 106. Fig. 4 shows how closely the pulse curve of the controls and patients now correspond.

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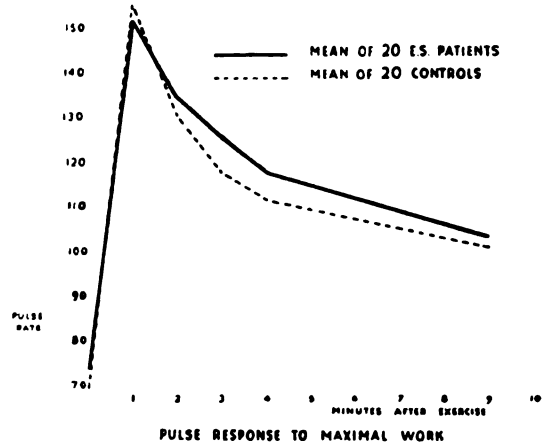

FIG. 4.

2. *Blood Lactate Rise following Maximal Work.*

As in the standard work, a blood sample for lactate estimation was removed at rest, and ten minutes after the cessation of exercise.

In the 20 controls the mean lactate rise was 78·0 mgm. per cent. ± 16·3 s.d. (the mean resting value was 11·2 mgm. per cent. ± 2·79 s.d., and the mean maximal figure was 89·2 mgm. per cent. ± 17·01 s.d.).

The 20 E.S. patients gave a mean rise of lactate from the resting level 50·2 mgm. per cent. ± 11·06 s.d. (mean resting level 12·6 mgm. per cent. ± 3·1 s.d., and mean maximal figure 62·8 mgm. per cent. ± 11·28 s.d.). The difference between the means (c.r.) is significant, being 6·22 ($P < ·01$).

Of these 20 patients, 8 belonged to Group 3 E.S., and 12 to Group 2 E.S. Both groups gave almost similar results, the mean maximal lactate rise being 48·0 mgm. per cent. in Group 3 and 51·1 mgm. per cent. in Group 2.

3. *Blood Gas Analysis and pH.*

Material and Technique.

A group of 10 Group 2 E.S. patients was chosen, all of whom were free from organic disease and had ages ranging from 25 to 31. They all gave a history of effort intolerance from earliest recollection, and it was felt that constitutional physical inferiority was more important in these men, and had more to do with their excessive response to exertion than had emotional factors.

A group of 16 controls was taken from the available hospital staff, and included 7 doctors, none of whom took any regular exercise, 4 members of the physical training staff, and 5 others of whom two did a certain amount of track running.

Blood samples were taken from the subject at rest, immediately after the cessation of exercise, to give the pH and lactate picture at the exhaustion point, and a third sample five to ten minutes later to give the maximum lactate figure, and also to determine the behaviour of carbon dioxide during recovery. The first and third samples were arterial blood taken from the

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femoral artery of each leg. The second sample was arterialized venous blood from the median basilic vein of the arm which had been heated to 45°C. in an arm-bath ; this was done in preference to arterial puncture because the blood sample could be obtained without the slightest delay. Arterial punctures were not used in the controls as the physiology of exercise in normal people and in athletes has been extensively studied elsewhere, and the results would not affect the conclusions to be drawn about E.S. The blood, having been withdrawn in an all-glass syringe lubricated by the minimum amount of paraffin, was transferred under oil to a centrifuge tube and cooled in ice-water immediately. Samples were analysed for oxygen capacity by the method of Sendroy (Peters and Van Slyke (30)) : oxygen content and carbon dioxide content (Peters and Van Slyke (30)) : pH (Barker and Summerson (31)).

TABLE IX.—*Changes in the Arterial Blood Chemistry of* 10 *E.S. Patients Worked to Exhaustion Point on a Bicycle Ergometer. The Figures in the Time Column Represent Resting, the Time Worked before Exhaustion, and the Time Interval between the Completion of Exercise and the Removal of the Third Blood Sample (in Minutes).*

Case.	Time.	O_2 C.P.	O_2 Sat.	pH.	Shift.	pCO_2.	$BHCO_3$.	Lactate.	Increase.
1.	0·0	120·1	97	7·42	·11	40	24·2	8·0	34·8
	3·1	21·8	94	7·31		42	20·1	38·2	
	7·3	21·2	96	7·36		31	17·0	42·8	
2.	0·0	22·2	97	7·45	·07	35	22·8	8·1	28·0
	4·0	23·1	93	7·38		39	21·6	19·6	
	7·0	22·4	98	7·40		35	20·3	36·	
3.	0·0	19·4	97	7·43	·04	40	24·7	14·7	22·3
	4·3	20·2	91	7·39		36	20·2	35·8	
	10·0	19·7	96	7·44		33	21·4	37·0	
4.	0·0	21·0	96	7·41	·07	39	23·2	22·6	32·6
	4·5	22·4	95	7·34		39	20·0	55·2	
	10·0	21·2	95	7·39		38	21·4	47·3	
5.	0·0	20·1	93	7·44	·10	39	21·4	11·3	20·3
	5·0	21·1	92	7·34		39	25·1	31·6	
	5·0	20·6	93	7·44		33	19·7	26·9	
6.	0·0	20·0	96	7·43	·11	38	21·2	6·4	28·4
	5·4	21·6	72	7·32		43	23·0	24·4	
	5·0	20·4	96	7·37		28	20·5	34·8	
7.	0·0	17·6	97	7·44	·08	38	15·7	9·1	43·0
	6·2	18·7	92	7·36		36	24·0	52·1	
	6·5	18·5	95	7·40		34	19·2	39·0	
8.	0·0	21·5	95	7·44	·08	40	20·2	9·1	34·3
	6·5	22·6	95	7·36		37	25·7	43·4	
	7·2	21·8	97	7·40		34	19·5	43·4	
9.	0·0	19·4	97	7·43	·11	41	20·0	17·5	71·5
	7·0	21·5	92	7·32		37	25·6	89·0	
	10·0	20·2	97	7·34		43	18·0	90·7	
10.	0·0	20·3	92	7·41	·11	39	23·6	8·3	47·1
	7·1	22·0	100	7·30		31	14·9	55·4	
	6·0	20·4	98	7·32		33	16·7	44·3	

Results.

Oxygen metabolism.—Table IX gives the figures for oxygen combining power and oxygen saturation of arterial blood before, immediately following and approximately five to ten minutes after maximal work in 10 Group 2 E.S. patients. It is immediately apparent that there is no evidence of anoxaemia in the resting blood or even post exercise. Case 6 is the only exception (oxygen

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saturation immediately after exercise, 72 per cent.); all other bloods taken post exercise have an oxygen saturation of 91 per cent. or over.

Hyperventilation.—Table IX gives the results obtained from maximal work in the 10 E.S. patients tested. It will be seen that there is no evidence of respiratory alkalosis resulting from resting or post exercise hyperventilation.

The results show clearly that though there may be a fall of carbon dioxide pressure after exercise, this is not abnormal in amount (generally 3 or 4 mm.Hg, the most extreme being a fall from 38 to 28 mm. Hg), and is correlated with fall of bicarbonate following the production of lactic acid. In no case did the blood pH become more alkaline than the resting value.

It might be argued that we have looked for the development of alkalosis too soon. We were guided by the fact that in all the patients chosen excessive respiration had almost died away five minutes after the conclusion of exercise, and whenever we have taken another blood sample after a further five minutes this has simply shown a slow return of the pH to the resting value.

Blood lactate rise.—Table IX includes resting and post-exercise blood lactate levels, as they afford a good index of the physiological state of the patient when he reached "exhaustion point." These patients show an even lower lactate rise than the 20 E.S. patients already described (see p. 407): a mean rise of 36·2 mgm. per cent. compared with 50·2 mgm. per cent.

Discussion on Response to Maximal Work.

In considering the response to maximal work, it is clear that the lactate rise when the 20 E.S. patients exercised to complete exhaustion on the bicycle ergometer (mean rise 50·2 mgm. per cent. ± 5·74 s.d.) was significantly different from the response of the 20 controls (mean lactate rise 78·0 mgm. per cent. ± 8·15 s.d.). There was no real difference between Group 2 and Group 3 E.S. in this respect. Kuehr, Dill and Neufeld (25) have shown that, in running, the ordinary young man will stop from exhaustion when the lactate level in the blood has reached approximately 100 mgm. per cent. (i.e. lactate rise of about 90 mgm. per cent. above the resting level). As more muscles are employed in running than in the type of ergometer we used, our lactate control figures are understandably somewhat lower than those of the Harvard Group. The results obtained suggest that E.S. patients (both Groups 2 and 3) give up exhausting physical work before they have reached a "physiological" end-point. The fact that these patients typically dread the supposed ill effects of strenuous physical exercise, because they fear the damage which may result to their hearts, etc., results in what amounts to an effort phobia.

The arterial blood gas analysis gave no evidence of anoxaemia; at rest the oxygen saturation of arterial blood in 10 E.S. patients ranged from 97 per cent. to 92 per cent. (mean 95·6 per cent.), and after maximal work the oxygen saturation was found to be below 90 per cent. in only one case. The suggestion put forward by Haldane *et al.* (19), and later by Hick *et al.* (24), that the symptoms of effort syndrome were due to anoxaemia of effort, was contra-indicated by our findings. Nor did we find any evidence to support the hypothesis of Soley and Shock (23) that E.S. is the result of respiratory alkalosis.

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After maximal work no E.S. patients showed evidence of hyperventilation alkalosis—the blood pH was never found to become more alkaline than the resting value, and the carbon dioxide pressure fell by only 3 to 4 mm. Hg. in most cases the greatest fall being 10 mm. Hg.

(*c*) LIGHT WORK.

Metabolic response to light work or respiratory exercise tolerance test.

Method.

A portable Benedict metabolism apparatus was used, and on the day previous to a test the patient was familiarized with the procedure. The exercise was performed on a bicycle ergometer. When tested the subject rested comfortably on the couch for half an hour, after which the mouthpiece of the spirometer was put in position, and a kymograph record of the respirations made for four to five minutes (see Fig. 5). The tap was then turned so that the subject

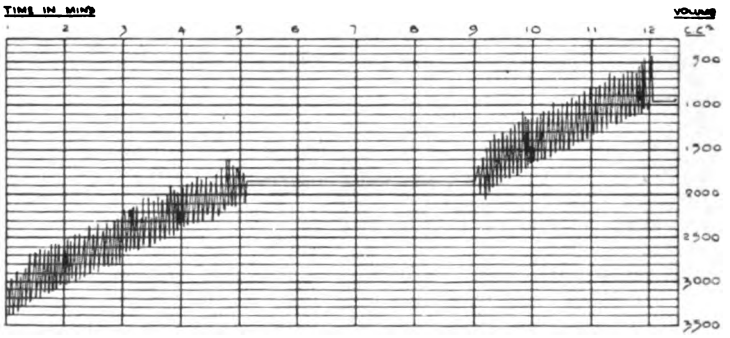

FIG. 5.—Respiratory exercise tolerance test.

was breathing from the outside air. He now placed his feet on the pedals and pedalled at 42 revolutions per minute for exactly one minute, the friction of the brake band being equivalent to a weight of 6 lb., i.e 4,500 ft.lb. per minute. He then lay recovering his breath for a further three minutes, at the end of which time the tap was again turned on, and the respirations for the fourth, the fifth and the sixth minute after exercise recorded. The mean minute volume before and after exercise was then compared, the latter being expressed as a percentage of the former.

Results.

We have figures of 10 controls and 13 E.S. patients. The mean for the controls was 107 per cent. ± 10·4 s.d.; i.e. the ventilation in the period four to six minutes after exercise was 7 per cent. greater than the resting ventilation, while the mean for the patients was 134 per cent. ± 14·2 s.d. The difference between the two means is significant (c.r. 5·0 ; $P < \cdot 01$), and the ranges are such that the test probably has diagnostic value within certain limits.

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(*d*) MINIMAL WORK OR PEDALLING UNOPPOSED.

Method.—Pedalling Unopposed.

Spirometric tests are of value only when breathing is reasonably regular, when a patient's co-operation can be obtained and when the patient is not emotionally upset by the procedure. Some patients may breathe well at rest, but when they are put in a work situation anomalies of breathing occur. In order to categorize the good and the bad breathers and in order to observe the effect of a work situation on respiration we make use of the following procedure: A subject lies on his back and breathes into the spirometer for five minutes at rest; he is then asked to place his feet on the pedals of the bicycle ergometer and pedal slowly for seven minutes. As the brake band is not in use, the subject pedals against no resistance; there is normally little increase in the total ventilation or oxygen uptake (see Fig. 6).

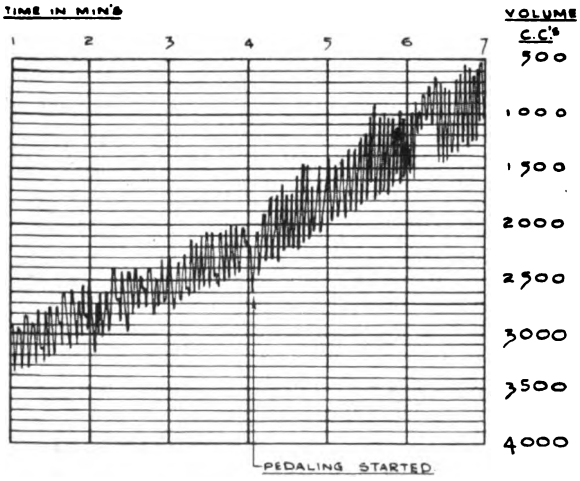

FIG. 6.—Pedalling unopposed. Normal response.

Results.

Of 75 E.S. patients tested, 36, or 48 per cent., gave a normal tracing; 25, or 33·3 per cent., showed ventilation in excess of normal, and of these, although only 1 patient gave clinical signs of tetany, practically all the remaining patients complained of giddiness, headache, breathlessness, tiredness in the legs or pounding of the heart; paraesthesias were not complained of. Six patients (8 per cent.) gave up before the end of the seven minutes saying they were exhausted. Of these, 2 had symptoms and signs indicating tetany, 1 appeared to lose consciousness, although there were no other tetanic manifestations, and of the remaining 3, 2 showed hyperventilation but no tetany, and 1 showed a progressive decrease in the volume per breath to such an extent that anoxaemia probably contributed to his breakdown. The remaining 8 patients (10·7 per cent.) gave tracings with irregular breathing, and were all mostly persons who were emotionally upset by the test. Thus, of the 75 patients tested, only 48 per cent. appeared to breathe normally in a work situation.

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These results show the neurotic trends of many of the subjects tested, and the tendency for irregular and excessive breathing to occur in a work situation, although practically no work is performed by the subject (see Fig. 7).

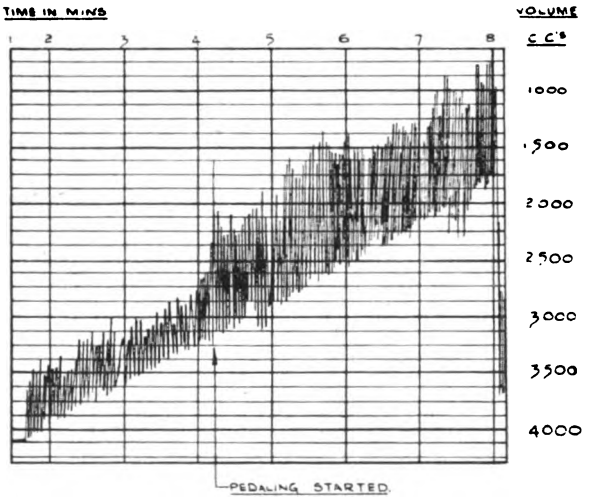

FIG. 7.—Pedalling unopposed. Hyperpnœic response.

DISCUSSION OF THE RESULTS ON EXERCISE RESPONSE.

The standard work test differentiates significantly between groups of normal controls, and both Group 2 and Group 3 E.S. patients, and chronic anxiety states, when any of the three criteria—pulse response, oxygen uptake, or blood lactate rise—is used. The same is probably true when we compare groups of normal controls and somatic anxiety states. Hysterical patients as a group cannot be differentiated from normal controls in this way. While it is true that the above groups of neurotic patients can be differentiated from normal controls by the tests mentioned, it is doubtful if the application of these tests to the recovery period following moderate work is the best available procedure. Craig Taylor (33) has shown that the individual's fitness for hard work is best measured *during* exercise, and not during the recovery phase. On maximal work he finds that the time run is more reliable than any of the physiological measures he used (heart and respiration rates, ventilation, blood lactate, and oxygen consumption). Heart rate and blood lactate were the most reliable submaximal measures, but are approximated in maximal work by per cent. oxygen and oxygen consumption. Unfortunately, because of the feeling of suffocation and other emotional difficulties, which inevitably occur when testing neurotic subjects, we were forced to apply our tests only during the post-exercise recovery period.

The ventilation response to standard work shows clearly that comparing groups of normal controls and E.S. patients and somatic anxiety states, the patients breathe much more rapidly following exercise, although the volume

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per breath is much the same in all three groups. Obviously, the patients hyperventilate compared with the controls, but the blood gas studies following maximal work show no evidence of respiratory alkalosis. The respiration of the two groups of patients appears to be less efficient than in the control group—the relatively low oxygen equivalent (ventilation required for the assimilation of 100 c.c. of oxygen) in the control group is one way of expressing this greater efficiency.

The lactate rise following maximal work was significantly different between controls and E.S. patients (both Groups 2 and 3). This difference would appear to be due to the effort syndrome's "effort phobia," i.e. his unwillingness (probably often unconscious) to overtax his strength for fear of damaging his heart, etc. Unfortunately we had to use an improvised bicycle ergometer so that the amount of work done before exhaustion could not be measured. We did not test other groups of neurotics on maximal work, so cannot say if the relatively small lactate rise following "maximal" work is an attribute of neuroses in general.

Using a respiratory exercise tolerance test (a measure of the ventilation response to light work), we found it possible to differentiate a group of normal controls from a group of E.S. patients.

Of the three responses to standard work which were tested—pulse rise, lactate rise, and oxygen uptake—oxygen uptake seemed to be the most satisfactory test for differentiating normal controls and the various neurotic groups. All groups of neurotic patients were significantly different from the controls ($P. < \cdot 01$) except the somatic anxiety group, which was probably significant ($P < \cdot 02$). For the total group of 59 neurotics tested compared with the group of 20 normal controls the significance of the difference between the means for the three tests was : oxygen uptake, c.r. 7·1 ; pulse area, c.r. 5·0 ; lactate rise, c.r. 3·8.

No conclusions can be drawn as to the cause of the poor exercise response in patients complaining of symptoms of effort intolerance—clinically E.S. Groups 2 and 3. The nature of the response to maximal work indicates that there is an "effort phobia," but this does not explain the relatively inefficient pulse, lactate, and oxygen uptake response in E.S. patients compared with controls. The fear of possible ill effects of heavy work in the E.S. patients presumably produced a state of muscle tension, and, as was shown in our pedalling unopposed studies, marked anomalies of respiratory pattern were often produced by the mere work situation, even though no significant amount of work was performed. Hyperventilation often occurred on exercise, but without the production of respiratory alkalosis. This hyperventilation represented excessive work by the muscles of respiration, and might possibly contribute to the inefficient performance. A normal control with a mean oxygen uptake of 555 c.c. per minute for the five minutes post standard exercise repeated the standard work simulating the hyperventilation of the E.S. subject ; he breathed at 42 respirations per minute during the exercise, and 60 per minute post exercise ; the mean oxygen uptake was now 606 c.c. per minute, while the lactate rise showed no difference (7·0 mgm. per cent.) ; post exercise ventilation had been increased from a mean of 19·4 litres per minute to 30·4

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litres per minute ; breathing in this manner proved to be hard work and was difficult to maintain ; there were no symptoms or signs of hyperventilation tetany. The same subject was given intravenous atropine gr. $\frac{1}{100}$ at a time until no further pulse rise occurred ; the pulse-rate rose from 69 to 138 per minute, at which point the standard exercise was started ; for this test the mean oxygen uptake for the five minutes post exercise was 900 c.c. per minute, and the lactate rise 14·0 mgm. per cent. ; the mean post exercise ventilation was 26·5 litres per minute. Subjectively the control complained of dry mouth, postural giddiness, muscular inco-ordination on walking, fatigue, irritability, diminished pressure on micturition, feeling of eye strain and difficulty in accommodation. Finally, the same subject was given 0·7 c.c. of 1 : 1,000 adrenalin solution subcutaneously : after ten minutes a tense feeling in the epigastrium, mild palpitation, and a feeling of constriction in the chest were remarked, and there was pallor of the face—the pulse had risen from 64 to 81, and at this point the standard exercise was started. Unlike the atropine test, no difficulty was experienced during the pedalling, and no subjective discomfort was described post exercise. The mean oxygen uptake for the five minutes post exercise was 538 c.c. per minute. These results suggest the possibility of changes in exercise efficiency in relation to functional changes in the involuntary nervous system ; however, consideration of the clinical material used does not clarify the situation very much. Symptoms and signs due to vegetative dysfunction were present in E.S. Group 2, E.S. Group 3, and somatic anxiety states, and were absent in the chronic anxiety states and hysterics. If clinical evidence of disturbance of vegetative function were the determining factor in exercise efficiency, then both the chronic anxiety and hysterical groups would perform as efficiently as the normal control group. This did not prove to be the case, and the chronic anxiety group was significantly different from the control group on all three tests on standard work—pulse, lactate, and oxygen uptake—while the hysterical group was significantly different from the control group in oxygen uptake.

We sought other physiological leads which might throw some light on the mechanism if not the aetiology of poor exercise response. The forearm blood flow was measured with a Lewis and Grant plethysmograph. We measured the arm blood flow at rest and then following work on the bicycle ergometer ; to our surprise no increase in the arm volume occurred until very heavy work was done—apparently the increased blood flow caused by the work was all directed to the leg muscles which were doing the work ; certainly it did not reach the arms until the subject was near exhaustion. This " homeostasis " was less marked in the E.S. patients than in the controls ; in fact some controls even when worked to complete exhaustion showed no rise in the arm blood flow. We gave up this promising line of inquiry because we had no facilities to control environmental circumstances (temperature, humidity, etc.) and test re-test reliability proved unsatisfactory.

Studies of cardiac output following work by the direct Fick method (McMichael and Sharpey-Schafer (34)) were contemplated, but permission to catheterize the right auricle in service patients was refused.

By applying a tourniquet to the upper arm and eliminating the general

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circulation we hoped to study the local muscle chemistry, particularly the lactate rise following a known amount of work to the forearm muscles, but removing constant amounts of venous blood proved difficult, and again we could not obtain a high day-to-day reliability.

In brief our efforts to measure poor exercise response in E.S. met with some degree of success, but no real understanding of the mechanism of this poor exercise response was achieved.

Having studied the neurotics' response to exercise stress we decided to apply other stresses, and see if again differences between groups of normal controls and neurotics could be demonstrated.

2. RESPONSE TO PAIN.

For this test we measured the ventilation and blood-pressure response to a painful stimulus applied for approximately 2 minutes. The choice of a suitable painful stimulus presented difficulties, as we wished to use a relatively long test period. We finally decided to ask the patient to squeeze a rubber bulb until empty of air at a rate of 80 squeezes per minute (timed by a metronome). Immediately before starting this work a sphygmomanometer cuff was applied to the upper arm, and the circulation to the limb cut off by applying a pressure of 200 mm. Hg. The ischaemia was maintained for 2 minutes in all—one minute while pumping and one minute afterwards. During this time a dull ache of increasing intensity was experienced by the subject.

Material.

Twenty normal controls (a random sample of young soldiers), 10 cases of E.S., 10 cases of somatic anxiety not complaining of effort intolerance, and 8 cases of conversion hysteria were used for these tests.

(a) *Ventilation.*—The subject lay comfortably on a couch, and was habituated to the use of the portable Benedict metabolism apparatus. On the day of the test he was not fasted, but rested for 30 minutes on the couch before the test was started. When three minutes' regular breathing had been recorded on the spirogram the arm circulation was cut off, and simultaneously the subject started squeezing the bulb. The subject continued to breathe through the closed circuit, and respirations were recorded for three minutes following the cessation of pumping, i.e. one minute with the arm circulation still cut off, and two minutes with the circulation restored (see Fig. 8). The spirogram was then examined, and the average ventilation per minute for the three minutes at rest calculated. The ventilation during the minute when the subject was pumping was ignored, but the ventilation for the next minute, i.e. when the pain stimulus was at its maximum, was measured (see Fig. 8). This result was now expressed as a percentage rise or fall compared with the resting figure. The test was repeated on two successive days, and the final figure represented the mean of these two tests.

Results.—Table X shows the ventilation response to pain in the four groups studied. In 20 normal controls the ventilation showed a mean increase per cent. of 10·4 ± 16·5 s.d. (range − 11 to + 72). Four subjects showed a

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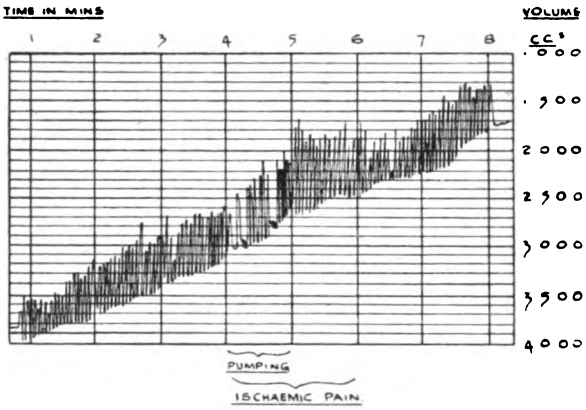

FIG. 8.—Ventilation response to a painful stimulus.

TABLE X.—*Ventilation Response to a Painful Stimulus. Units Represent Percentage Rise or Fall of Ventilation Compared with the Resting Ventilation. (Mean of Two Tests carried out on Successive Days.)*

	Range of ventilation.	Mean incr. % ventilation.	S.D.	C.R.	P.
20 normal controls	−11 to + 72	10·4	16·5	—	—
10 E.S. patients	− 3 to + 90	36·2	32·0	2·5	< ·02
10 anxiety states	−13 to +148	43·0	51·9	1·95	< ·04
10 E.S. and 10 anxiety states	−13 to +148	39·6	43·4	2·9	< ·01
8 hysterics	+ 5 to +140	57·1	42·7	3·0	< ·01

decreased ventilation as a result of the pain stimulus. The 10 E.S. patients gave a mean percentage ventilation increase of 36·2 ± 32·0 s.d. (range − 3 to + 90) . . . (c.r. 2·5 ; P < ·02). The 10 anxiety states gave a mean percentage ventilation increase of 43·0 ± 51·9 s.d. (range − 13 to + 148) . . . (c.r. 1·95 ; P < ·04). Taking the anxiety states and the E.S. patients together as a group of 20 patients the mean percentage ventilation increase is 39·6 ± 43·4 s.d. (c.r. 2·9 ; P < ·01). The group of 8 hysterics also differs significantly from the control group ; mean percentage ventilation increase 57·1 ± 42·7 s.d. (c.r. 3·0 ; P < ·01).

(b) *Blood-pressure responses.*—The same groups of patients and controls were used as in the last test, except that 2 hysterics were added, bringing the total of this group up to 10. The subject was rested lying down for 20–30 minutes with a sphygmomanometer cuff on both upper arms. When the B.P. was constant the circulation of the arm was cut off, and the subject squeezed a bulb for one minute in the manner already described. During the second minute when the ischaemic pain was increasing two B.P. readings were taken, and then minute readings for the next five minutes. The first two readings were invariably higher than the succeeding readings, and the higher of these two (systolic and diastolic) was used for comparison with the resting B.P. As before, each test was repeated on two successive days and the mean of the results calculated.

Results.—All but 2 (both controls) of the 48 subjects tested showed a rise of systolic B.P. during the ischaemic pain. No significant differences were

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found between the various groups. Controls mean rise of systolic and diastolic B.P. 14/16 mm. Hg (range of systolic B.P. − 3 to + 34 mm. Hg). Parallel figures for the other groups were 10 E.S. patients 11/11 mm. Hg (range 3 to 25 mm. Hg), 10 anxiety states 10/10 mm. Hg (range 2 to 21 mm. Hg) 8 hysterics 13/18 mm. Hg (range 3 to 24 mm. Hg).

3. Response to Cold.

The procedure in these tests was similar to that used for the ischaemic pain test except that a cold stimulus was substituted for the painful stimulus. The same 48 subjects were used as in the previous test. The technique for B.P. response was identical with the cold pressor test described by Hines (32).

(a) *Ventilation.*—The patient breathed into the closed circuit of a Benedict metabolism apparatus as before. After a satisfactory resting ventilation had been recorded for three minutes, the forearm and hand was immersed in a bath of water at 3°C., and held there for one minute. Respirations were recorded during this minute, and for three further minutes after the arm had been withdrawn from the water (see Fig. 9). The average ventilation per minute

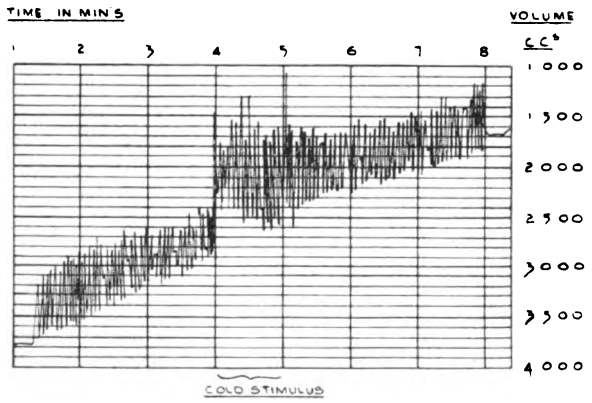

Fig. 9.—Ventilation response to a cold stimulus.

for the three minutes at rest was compared with the ventilation for the minute during the cold stimulus, and the rise or fall expressed as a percentage of the resting ventilation. As before, each test was repeated on two successive days, and the mean percentage rise or fall taken.

Table XI.—*Ventilation Response to Cold Units Represent Percentage Rise or Fall of Ventilation Compared with the Resting Ventilation. (Mean of Two Tests carried out on Successive Days.)*

	Range of ventilation.	Mean incr. % ventilation.	S.D.	C.R.	P.
20 normal controls	− 8 to +27	8·1	9·5	—	—
10 E.S. patients	− 6 to +91	32·3	25·2	2·9	<·01
10 anxiety states	−13 to +72	31·1	23·7	2·9	<·01
10 E.S. and 10 anxiety	−13 to +91	31·5	25·8	3·7	<·01
8 hysterics	− 6 to +77	27·0	22·1	2·4	<·03

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Results.—Table XI shows the ventilation response to cold in four groups studied. The 20 normal controls showed a mean increase percentage of 8·1 ± 9·5 s.d. (range − 8 to + 27). Three subjects gave negative results. The 10 E.S. patients gave a mean percentage ventilation increase of 32·3 ± 25·2 s.d. (range − 6 to + 91) . . . (c.r. 2·9 ; P <·01). The 10 anxiety states gave a mean percentage ventilation increase of 31·1 ± 23·7 s.d. (range − 13 to + 72) . . . (c.r. 2·9 ; P <·01). The group of 20 E.S. and anxiety states gave a mean percentage ventilation increase of 31·3 ± 25·8 s.d. . . . (c.r. 3·73 ; P <0·01). The eight hysterics showed a mean percentage ventilation increase of 27·0 ± 22·1 s.d. (range − 6 to + 77) . . . (c.r. 2·4 ; P <·03)

(b) *Blood pressure response.*—The same subjects were used as in the previous tests. When the resting B.P. had become constant the hand and forearm were immersed in a bath of water at 3°C. for one minute. Two B.P. readings were taken during this minute, and then one reading per minute for the next five minutes. The highest reading was compared with the resting B.P. The test was repeated on two consecutive days and the mean rise or fall of systolic and diastolic B.P. recorded.

Results.—One hysteric and one anxiety state showed no rise of systolic B.P., otherwise all 48 subjects showed a rise. No significant differences were shown between the various groups. The controls showed a mean rise of systolic and diastolic B.P. of 7/11 mm. Hg (range of systolic B.P. 0 to + 18 mm. Hg). Parallel figures for the other groups were 10 E.S. patients 11/11 mm. Hg (range − 4 to + 23 mm. Hg), 10 anxiety states 7/9 mm. Hg (range 0 to 10 mm. Hg), 8 hysterics 8/11 mm. Hg (range 0 to + 15 mm. Hg).

Discussion on Response to Pain and Cold.

The response to pain and cold stimuli may be discussed together, because the same subjects were used for both tests and the results are very similar in the two tests.

Comparison between the normal controls and neurotic subjects shows that the two groups are clearly differentiated by the respiratory response to pain and cold, but cannot be differentiated by the B.P. response to these two stimuli.

The ventilation response to cold (Table XI) differentiates the controls and neurotics rather better than does the response to pain (Table X). The ventilation response to cold is significantly different (P <·01) between the controls and the E.S. and anxiety groups, and probably significant (P <·03) with the hysterics.

The ventilation response to pain is significantly different (P <·01) between the controls and hysterical groups, and probably significant with the E.S. (P <·02) and anxiety groups (P <·04).

Taking the total 28 neurotic subjects and comparing them as a group with the 20 controls, the ventilation response to both pain and cold is significantly different between the two groups.

Test re-test reliability.—The total 48 subjects used in the ventilation response to both pain and cold were given each test on two separate occasions ; only

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a fair degree of reliability is shown by the two tests by applying the method of product moment correlation; for the pain response $\gamma = 0{\cdot}625$, and for the cold response $\gamma = 0{\cdot}506$.

The B.P. response to both pain and cold failed to show any significant difference between the control and neurotic groups. Studying the cold response, Hines (32) in his cold pressor test considers a systolic rise of 14 mm. Hg, and a diastolic rise of 10 mm. Hg. as indicating incipient hypertension; 4 controls showed a systolic rise of more than 14 mm. Hg. on one test only; 3 E.S. patients showed such a rise on both tests, and 1 E.S. patient on one test only; 3 anxiety states showed such a rise on one test only; 1 hysteric showed the response on both tests, and 2 on only one test. Hines found a positive response in 15 per cent. of his controls; if one positive test is accepted (and it is not demanded that the test be positive on both testings), then we found the test positive in controls 20 per cent., E.S. 40 per cent., anxiety states 30 per cent., and hysterics 30 per cent.

4. Response to Excitement.

It is difficult to devise an anxiety-producing situation which represents a suitable standard stimulus. We considered using the air raids on London, but although these certainly produced fear responses, there was no hope of standardizing the test situation. We finally decided to take the patient within a few minutes of his admission to the ward, and in the strange company and environment of the doctor's office. The patient was simply asked to remove his jacket and lie down; his pulse and respirations were recorded and B.P. was then measured. Two to three weeks later the patient was kept in bed fasting, and the above measurements repeated.

Material.—Unfortunately it was impracticable to use the above procedure on normal controls, as their relationship to the doctor would have been different compared with the patients, and they were not living in hospital, and therefore not becoming familiarized with the hospital surroundings. Despite the lack of normal controls for comparison with the patients it was felt that the test should be carried out on patients; 10 E.S. patients, 10 anxiety states, and 10 patients with conversion hysteria were studied.

Table XII.—*Mean Pulse Respiration and Blood-pressure Readings for Three Groups of Patients at First Interview (when Excited), and 2–3 weeks later under Basal Conditions.* (*Pulse and Respirations per Minute.*)

	First interview.			Basal.			Difference.		
	P.	R.	BP.	P.	R.	BP.	P.	R.	BP.
10 E.S. patients	84	22	144/85	70	19	114/72	14	3	30/13
10 anxiety states	81	23	138/79	65	20	113/74	16	3	25/5
10 hysterics	72	19	132/82	69	19	115/75	3	0	17/7

Results.—Table XII shows the mean figures of pulse, respirations and B.P. at the first interview (when excited), and some weeks later (when relaxed),

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for the three groups of patients tested. All three groups show a drop in the readings under basal conditions compared with the first interview—this drop is less marked in the hysterical group than in the other two groups, but there is no significant difference between the groups.

Taking the 10 E.S. and 10 anxiety states together the mean figures are as follows:

	Pulse.	S.D.	Resp.	S.D.	Syst. B.P.	S.D.
First interview	82	15·8	22	4·7	141	10·3
Basal	67	10·3	19	4·6	114	14·6

If one compared the mean systolic B.P. at first interview (141), with the mean basal systolic B.P. (114) in this group, the difference is significant (c.r. 6·8; $P < ·01$). The drop in mean pulse between the two interviews is also significant (c.r. 3·6; $P < ·01$). The fall in respirations is probably significant (c.r. 2·0; $P < ·03$).

Under basal conditions the systolic B.P. was below 100 mm. Hg. in 1 E.S. patient, in 3 anxiety states, and in 1 hysteric.

Discussion on Response to Excitement.

The results obtained show how misleading pulse, B.P., and respiration measurements may be in neurotics unless allowance be made for the emotional factor. Unfortunately, as no normal controls were available, it cannot be said that the results furnish further evidence of the relative vegetative over-responsiveness in neurotics indicated by the results of previous tests.

5. Response to Persistence Tests.

Two tests were adopted to test the subject's persistence in a setting of physical discomfort—(*a*) breath holding and (*b*) leg raising.

For the breath-holding test the patient was asked to stand, and at the top of a normal inspiration asked to hold his breath for as long as possible; this was timed by stop-watch.

For the leg-raising test the patient lay on his back in bed and raised his left leg to half a right angle; he was asked to maintain his leg in this position for as long as possible.

Material.—Twenty normal controls including nine young doctors were used. Fifty patients were used, made up of 35 E.S. patients and 15 anxiety states.

Table XIII.—*Significance of the Difference between the Means (C.R.) of 20 Normal Controls and 50 Patients (35 E.S. and 15 Anxiety States) on Breath-holding and Leg-raising Tests.*

	Breath holding			Leg raising.		
	Mean (secs.).	S.D.	C.R.	Mean (secs.).	S.D.	C.R.
20 normal controls	57·0	21·2	—	312	147	—
50 patients (35 E.S. and 15 anxiety)	34·9	15·4	4·2	135	61	5·2

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Results.—Table XIII shows the results of the breath-holding and leg-raising tests. For the breath-holding tests the mean of 20 controls was 57·0 seconds ± 21·2 S.D., and for the 50 patients 34·9 seconds ± 15·4 S.D. The difference between the two groups is significant—c.r. 4·2 ; P <·01).

On the leg-raising test 20 controls gave a mean of 312 seconds (5′ 12″) ± 147 S.D., and 50 patients a mean of 135 seconds (2′ 15″) ± 61 S.D. The difference between the two groups is significant—c.r. 5·2 ; P <·01.

Discussion of Results of Persistence Tests.

The results of both tests indicate that the neurotic patients as a group lack persistence in the type of situation used for the test. The tests may well measure the same psychological factor as the maximal work, when the subject was asked to work on an ergometer to complete exhaustion. The tests here described are of course much simpler to carry out, and might prove to be a useful and rapidly carried out clinical test. Work still remains to be done, however, to determine what information the tests really provide.

6. Other Findings.

Previous work on the blood enzyme choline esterase which hydrolyses acetyl choline formed at the synapses of neurones (Tod and Jones (35)) suggested that a relatively high level of choline esterase was found in the blood of neurotic patients with autonomic over-activity. This work was later confirmed by Richter and Lee (39). We found that 112 E.S. patients gave a mean blood choline esterase of 98 units ; this is significantly different to a group of 60 normal controls who showed a mean choline esterase of 79 units (P <0·01).

Insulin tolerance tests (Fraser *et al.* (36)) were done on 21 E.S. patients : 19 curves were essentially normal ; in the remaining two cases the blood sugars were significantly below the fasting level after two hours ; neither of these cases gave histories suggestive of spontaneous hypoglycaemic attacks, and there was no clinical evidence of pan-hypopituitarism. Facilities were not available for doing colorimetric assays of 17-ketosteroids in the urine.

Fatigue is prominent among the symptoms of dietary deficiency, particularly in relation to deficiencies of vitamin B_1 and C. Jolliffe *et al.* (37) described a clinical picture indistinguishable from E.S. occurring in volunteers deprived of vitamin B_1. We studied (38) vitamin B_1 (excretion and saturation test) and vitamin C (excretion and blood level) in 11 E.S. Group 2 and 10 E.S. Group 3. Vitamin C appeared to be low, but no lower than we found in normal subjects at that time of the year (winter). There was no evidence of vitamin B_1 deficiency in our patients.

Application of Objective Findings to the Treatment of Effort Syndrome.

Treatment of most psychiatric conditions presents great difficulties because all too often the cause is not clear. At the beginning of the century the advent of the psychoanalytic method raised hopes that aetiological forms of treat-

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ment would be applicable to most psychiatric problems; these high hop were not fulfilled, and there is no common agreement that psychoanaly is the method of choice in more than a relatively small group of neurotic case and in few, if any, psychotic cases. Further, the impracticability of a meth which limits one therapist to treating 100 patients in a lifetime cannot overlooked. More recently physical methods of treatment—insulin com E.C.T., and leucotomy in particular—have given good therapeutic results i psychotic patients; here, however, one is dealing with purely empirical proc dures, and although much research has been stimulated, no important findin have yet resulted either as to the nature of the illnesses treated (mainly schiz phrenia and depression), or the mode of action of the treatment. At presen it is possible to hear one authority advocating psychoanalytic treatmen (lasting 2 or 3 years) for a case of depression, and another authority advocatin E.C.T. (lasting 2 to 3 weeks) for the same case. Obviously the therapist placed in a very difficult position when deciding on a course of treatment, bu whatever his training and temperament may dictate, there can be no questio that the more relevant facts collected about a case, the better balanced wi be the course of treatment planned.

We started treating our E.S. patients and anxiety states at the beginnin of the war with no fixed attitude towards procedure. We were a mixe group of physicians, psychiatrists, and research workers, and felt that man questions had to be studied, and if possible answered, before we were able t adopt any general orientation in treatment. Naturally we set about collectin clinical data from our psychiatric and physical examinations. The latte aspect of the problem has been very adequately covered by Paul Wood i his Goulstonian Lectures (1). The questions posed at the beginning of thi thesis indicate the extent of our objective studies; the content of the thesis supplies the answers to these questions. How did all this help us in deciding on treatment procedures? In severe cases of E.S. there was ample evidence from the symptoms and clinical signs that the subject was ill; milder cases, however, were often difficult to distinguish from the hystero-malingerer: further, we did not know if despite the symptoms we would be able to demonstrate by objective means a poor exercise response. Our studies showed us that these men as a group had a poor exercise response, but the complete understanding of the nature of this disability eluded us. Nevertheless, the nature of the symptoms and signs (palpitation, hyperpnoea, postural giddiness and fainting, left chest pain, tension headaches, cold blue hands, emotional sweating, etc.) all suggested that whatever the basic aetiological factor or factors in the condition were, vegetative imbalance was one accompaniment of the disturbance. Our studies of respiratory response to pain and cold gave further objective evidence of this autonomic lability. Our inquiries had shown us that the E.S. patient *had* a disability, i.e. a poor exercise response; further, the response to maximal work showed that there was an effort phobia —that the E.S. patient failed to drive himself to physiological end-point, presumably for fear of the possible ill effects (to his heart) of excessively hard work. The patients themselves invariably attributed their condition to some physical disease—almost always heart disease. Repeated physical examina-

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ions, X-rays, and reassurance by cardiologists, etc., had failed; they were old they had no heart disease, but how did that simple reassurance help them o deal with their palpitations, left chest pain, fainting, etc., which after all vere not imaginary? We soon realized that we had to educate these men o that they could come to realize the true meaning of their symptoms; only hus could they reasonably be expected to give up the idea of heart disease vhich the symptoms so strongly suggested. The lay public has a very limited catalogue of medical illnesses, accumulated largely by hearsay and visiting relatives and friends in hospital; one of the few conditions which is commonly known and feared is "heart disease," and it would be strange, indeed, if a layman assailed by palpitation and precordial pain failed to diagnose himself immediately—in an age when most physicians are ignorant of psychosomatic medicine we cannot ask too much of the layman. But we soon found that to teach the physiological factors contributing to palpitation, breathlessness, left chest pain, tension headaches, postural giddines and fainting, emotional fatigue, etc., to individual patients made impossible demands on our time. So in 1941 we started taking the whole ward of up to 100 patients with E.S. as one group. Details of the method evolved would be too long to elaborate here (Jones (12, 43)). In brief, three hours of instruction were given each week—a course covering 12 hours of instruction. In this way the course lasted one month, and as the average length of stay in hospital per patient was six to eight weeks, there were always some patients in the group who had had a complete "course." This was valuable, as our method was to let the patients themselves work out the mechanism of their symptoms, e.g. the doctor would suggest that they should try to work out the mechanism of postural giddiness, and simply guide the ensuing discussion. We found this to be much the best educational procedure for our particular needs, and it was astonishing how articulate even a dull intellect could become. Most of the men had had mechanical training in the army, and enjoyed wrestling with the intricacies of human physiology. And the subject *was* interesting to practically everyone; our own studies of exercise physiology were referred to frequently, and correlated with the exercise response of athletes as well as their own poor performances. Moreover, most of the men had actually performed the tests and even helped in the laboratory in some capacity, e.g. some excellent equipment was made for us by the patients. We drew freely from such fascinating studies as *Human Gastric Function*, (Wolff and Wolff (40)), *The Wisdom of the Body* (W. B. Cannon (41)), and *Progressive Relaxation* (E. Jacobson (42)), as well as papers in the literature on fainting, etc. The subjects of the talks are the following:

1. The understanding of the voluntary nervous system, and its functions in maintaining external harmony, e.g. you find a room too noisy, so you get out.
2. The understanding of the internal milieu, and the function of the involuntary nervous system in maintaining harmony.
3. The two parts of the involuntary nervous system, and possible combinations, i.e. the sympathetic acting as a whole and the para-sympathetic acting in part.
4. Application of the previous two talks on external and internal harmony, e.g. it is a hot day so what happens (*a*) in the thinking part of your brain? and (*b*) in the automatic part?

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5. The understanding of fear, (*a*) its physical and somatic aspects; (*b*) its teleological value; (*c*) its "ordinariness."
6. Nerves. Nervous tension. Muscle tension.
7. Relaxation. Anxious face. Awkward attitude. Restlessness in bed. Action potentials and thinking.
8. Left chest pain and breathlessness.
9. Circulation, cold blue hands, giddiness, fainting, blanching, blushing, etc. Homeostasis and the efficient distribution of blood.
10. Nervous dyspepsia.
11. Fatigue, nervous and muscular; fatigue of activity and of inactivity.
12. Depression and insomnia.

The main advantages derived from these talks would appear to be:
1. The patient is given an idea of anatomy and physiology, sufficient to allow him to objectify his symptoms.
2. The discussion of symptoms (which he may or may not have) in an impersonal manner also tends to produce an objective attitude towards his symptoms.
3. The conversation being on the patient's favourite topic, i.e. health, is of great interest to him.
4. The situation is an informal one, and the patients may be less tense than when being interviewed individually, and may therefore be presumed to be more receptive.
5. The group acceptance of a point has a strong suggestive value.
6. The patient's self-respect is considered; to give up his organ neurosis would entail a loss of prestige in his own eyes, and in those of the outside world. This is countered if he can give a reasonable explanation of the meaning of nervousness, and has a realization of the enormous importance of this factor in medicine.
7. If he genuinely wants help he will be relieved to learn that no serious consequences need result from his symptoms.
8. The opportunity for raising health problems three times a week in open discussion leads to less health talk amongst the patients themselves, and, more important, leads to a more critical and informed attitude by his audience in the ward.
9. After a time the patients come to appreciate the "ordinariness" of their symptoms.
10. There is an enormous economy in doctors' time.

Our aim in these talks was not the elimination of symptoms, but a change of attitude towards the symptoms—that they should no longer be attributed to heart disease, etc., but understood as resulting from the autonomic accompaniments of emotional conflicts. Many of the patients (E.S. Group 2) had had a previous disability (poor exercise response) which they had simply accepted as a limitation, but under the stresses of the army in war-time this disability became an illness, the subject now showing a neurotic attitude towards his symptoms. Our aim was not to eliminate these symptoms, but to alter the man's attitude, and get him back to his previous rational acceptance of a slight disability. To achieve this it was usually necessary either to transfer him to lighter duties, not entailing violent physical exertion, or discharge him from the army. The percentage of E.S. patients returned to the army was as follows: 1941, 49 per cent.; 1942, 63 per cent.; 1943, 59 per cent.; 1944, 66 per cent. Unfortunately no adequate follow-up of this material is available, but the results must have been reasonably good, since a large percentage of failures would inevitably have been returned to Mill Hill as the main E.S. unit in the country.

In conclusion, no attempt has been made to go into the treatment of E.S. in any detail. Our findings showed that E.S. is not a psychiatric diagnosis,

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and the usual psychiatric diagnosis should be used, with effort syndrome added in brackets. To discuss fully the treatment of E.S. would be to enter the troubled waters of psychiatric treatment in general. Our aim has been to collect objective information regarding a syndrome, the nature of which was controversial, and apply this knowledge to the formulation of a treatment programme. It might be argued that a similar approach to the selection of cases suitable for the various forms of physical treatment in psychiatry is desirable. By objective study of the vegetative and other physical characteristics of case material, certain significant factors might emerge which might correlate with some clinical finding, e.g. the measurement of some attribute of "tension" might aid the selection of a suitable case for leucotomy; at present of two clinically similar depressions, one may respond favourably to the operation, and the other fail. Physical treatment methods certainly interfere with the body function, and they may well produce their effects by this change. We need such objective guides, since our clinical sense is wrong all too often; further, any such objective findings might throw some light on aetiology, and improve our treatment methods.

Summary.

1. Exercise Response to work done on a bicycle ergometer.

(*a*) *Standard work*: (6,750 ft.lb. of work per minute for five minutes).

A significant difference between a group of normal controls and groups of neurotic patients with various diagnoses was obtained by measuring the post exercise pulse response (pulse area), the post exercise oxygen uptake, and the blood lactate rise following exercise.

Post-exercise ventilation showed no evidence of deficient ventilation; the volume per breath was approximately equal in controls, effort syndrome (E.S.), and anxiety states, but in both groups of patients more ventilation was necessary for the assimilation of 100 c.c. of oxygen than in the controls.

(*b*) *Maximal work*: (work to complete exhaustion).

Twenty normal controls showed a significantly greater blood lactate rise following maximal work than did a group of 20 E.S. patients. It appeared that the E.S. patients gave up before a "physiological end-point" had been reached, or in other words, that the E.S. patients had an effort phobia.

Arterial blood gas analysis gave no evidence of anoxaemia after maximal work; nor was there any evidence of respiratory alkalosis resulting from hyperventilation after maximal work, judged by the blood pH and pCO_2.

(*c*) *Light work*: (4,500 ft.lb. of work per minute for one minute).

A simple respiratory exercise tolerance test was devised using a closed circuit metabolism machine. Significantly greater ventilation post exercise was recorded in the group of E.S. patients compared with the controls.

(*d*) *Minimal work*: (pedalling against no resistance).

A work situation without any real work being done was created by asking the subject to pedal the ergometer against no resistance. Respiratory tracings were obtained by using a closed circuit metabolism apparatus. The results

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showed a marked tendency in E.S. patients for irregular and/or excessive breathing to occur in a work situation.

The reason for the poor exercise response in neurotic patients was studied, but no definite conclusions were arrived at. An attempt to create experimentally a poor exercise response in a normal control showed that paralysing the vagus by intravenous atropine resulted in a greatly increased post exercise oxygen uptake; a much smaller rise resulted from voluntary hyperpnoea (simulating E.S. breathing), or the administration of adrenaline to the control before exercise. Neither muscle tension nor autonomic over-activity alone appeared adequately to explain the poor exercise response in neurotic patients.

2 and 3. Response to Pain and Cold.

Blood pressure and respiratory responses to these two external stimuli were studied. Significant differences between certain groups of neurotics and normal controls were obtained when the increased ventilation resulting from the stimulus was measured. The B.P. response to the two stimuli showed no significant difference between controls and neurotic patients.

4. Response to Excitement.

The emotional excitement of the initial interview was used as a stimulus, and pulse, respiratory, and B.P. readings taken at this time were contrasted with similar readings taken some weeks later under basal conditions. A possibly significant fall in pulse and B.P. readings occurred in certain groups of neurotic patients, but unfortunately no normal controls were available for comparison.

5. Persistence.

Breath-holding and leg-raising tests were used, and both tests showed significant differences between groups of neurotic patients and normal controls.

6. Other Findings.

The enzyme choline esterase was found to be significantly higher in a group of E.S. patients when compared with a group of normal controls. It is suggested that blood choline esterase is higher in subjects with autonomic over-activity.

Insulin tolerance tests done on E.S. patients gave generally normal results.

We found no evidence of vitamin B_1 deficiency in E.S. patients on quantitative testing (excretion and saturation test). Vitamin C (excretion and blood level) appeared to be low, but no lower than we found in normal subjects at the same time of year (winter).

7. Treatment.

The above objective findings were used to guide our formulation of a treatment programme designed to combat effort intolerance in E.S. patients. Education of the patient to an understanding of the meaning of his symptoms is considered to be the most important aim. Twelve hours of physiological

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and psychological talks were given each month to the whole group of E.S. patients. Cures were not expected, but rather a change of attitude by the patient towards his symptoms—these which previously had been regarded as an illness were now accepted without anxiety as an understandable physical disability. The wider question of the psychiatric treatment of the neurosis itself is not discussed, as our concern is primarily with poor exercise response, and the symptoms related to this.

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PERSONALITY CHANGE AND PROGNOSIS AFTER LEUCOTOMY.

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THOUGH twelve years have now passed since the first prefrontal leucotomy was performed, the status of this form of therapy is still far from settled. There are some who would never perform the operation at all; and some who would reserve it for the chronic sick; while others (Fleming, 1944) would advise its use at an early stage in the illness in cases where there were reasonable grounds for believing that recovery would not otherwise occur. With opposition of a purely emotional kind, the profession as a whole need hardly concern itself; for appeals that the integrity of the nervous system be maintained at all costs are unlikely to impress those whose daily work brings them into contact with the personality degradation of chronic mental illness. It is difficult to see why interference with the brain in order to save sight or to save life in the case of tumour should be regarded as either more or less wicked than interference designed to save human reason.

Much more important, however, is the essentially reasonable demand that the indications for, and effects from, the operation should be known with as much precision as obtains in other types of surgery. And it is still unfortunately true that there are few contributions to the literature which have produced any solution to these problems. If it were known, for example, that 50 per cent. of schizophrenics could be improved substantially by the operation, this would not be much assistance in assessing the prognosis of an individual case, for one could not say more than that there were equal chances of recovery and failure. In fact the statement would be untrue, for the figure of 50 per cent. would apply only to the average of a widely heterogeneous group, and the case considered might well be of a type with either an extremely good or an extremely bad prognosis. The same considerations apply with equal force to depression. It is now clear that tension is not the prognostic guide that it was thought to be, for it is well known that many tense depressives are not cured by leucotomy, while a few placid schizophrenics are. The position with regard to personality change is better and there is now an increasing number of careful assessments available. Nevertheless it is still uncertain to what degree a frontal lobe syndrome, if such a syndrome exists, is a gainful exchange for a psychosis.

The present paper arose out of a study of 59 consecutive cases on which the operation had been performed in this hospital, and some of which had been discharged subsequently. It appeared probable that improvement continues for much longer than was originally thought to be the case, and the study was therefore confined to those whose operation had been performed not less than

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three years previously. Only two cases out of the original series of sixty-one proved to be untraceable. Every case, whether discharged or not, was examined fully by the author; and in the case of those discharged a trained social worker visited the home and interviewed the family. In some cases, with the patient's permission, the employer was interviewed as well. Every effort was made to approach the problem of personality change with an open mind; and the following directive to the social workers indicates the scope of the investigation in its original informal language, being supplemented by personal discussion.

"INVESTIGATION OF LEUCOTOMY CASES.

"The purpose of the investigation includes much more than an inquiry into the effect on the patient's illness. It is desired to know what leucotomy has done to him as a social unit. This to a large extent depends not on what he says himself, but upon what other people think of him, and we want every possible source of information to be tapped.

"Informants should be told that there is no ulterior motive behind the inquiry and that the patient will not be interfered with, but that we are merely obtaining information of the results of leucotomy to help other patients.

"Informants should be encouraged, after an explanation, to give an account themselves, without prompting, of what they think of the patient, for such an integrated account will be far more valuable than a list of answers to specified questions.

"However, special inquiry is desirable into the following:

"(1) *Work.*—What different jobs he has held, and between what dates; why the job was changed; the patient's reaction to his work, and his employer's reaction to him; any slackness, lateness, under- or over-conscientiousness.

"(2) *Marriage.*—Any difference in sexual habits—any difference in frequency, the appearance of perversion, etc.; any change in his affection for his family, and concern about their welfare. Any irritability, outbursts of temper, depression, sleeplessness, etc.

"(3) *Personal habits.*—Any changes in his hobbies; whether he reads more or less than he used to; what sort of things he reads.

"*Conclusion.*—I do not know what the investigation will reveal, which is why it will be so interesting to do. It may be that these patients are apathetic and lacking in ambition, and rather more vegetable-like than they were before. It may be that they are irritable, ill-tempered creatures, cruel and indifferent to their families, or, on the other hand, they may be placid, good-tempered helpmates. Please, therefore, do not be bound by the above, and follow up any line which appears to be revealing some personality change in the patient.

"In essence, what we want to know is what leucotomy does to the man's soul."

It is abundantly clear that personality change due to the operation alone can only be assessed in those who have fully recovered, and cannot very well be separated from the symptoms of chronic illness when the latter is still present, in however mild a form. Such conclusions as have been drawn, therefore, about personality change are from the affective states alone, and only

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from those whose condition was classified as "excellent." Alteration of that facet of intelligence which is measured by intelligence tests is not discussed here because many workers have shown that it is not altered. With regard to psychometric measurements of other kinds, it seems to the author that a practical study based upon the reactions of those who live with the patient and upon his performance in ordinary life should give a more useful type of information, and should avoid the introduction of unnecessary and complicating variables.

Personality Change.

That the possibility of change in personality after leucotomy should arise at all is, of course, a logical consequence of the change known to follow injury or disease of the brain, and a few of the salient features may be mentioned here. The best known example is, of course, Harlow's crowbar case, in which marked personality changes followed an extensive bilateral frontal injury, the extent of which was reconstructed when crowbar and skull were jointly available. Jacobson's work on chimpanzees is equally well known, and was important in moulding the early attitudes to leucotomy. Rylander (1939) reported extensively on the effects of excision of parts of the frontal lobe in man, and believed that changes in personality often occurred which, though not enough to prevent a fairly normal social adjustment, might well be fatal to an intellectual worker. Cobb (1944) points out however that scrutiny of Rylander's case-histories shows that in these cases either both lobes were involved, or the clinical pattern was complicated by epilepsy. He concludes that there is little evidence in Rylander's cases of personality change after unilateral disease. Harrower Erickson, too (1940), judging personality by the Rorschach test, found abnormality to be correlated, not with local disease, but with general brain disturbance from pressure or displacement. Brickner's report of Dandy's case and Ackerley's report of Spurling's case (1935) have been quoted on many occasions. It will be remembered that in Spurling's case the left prefrontal lobe was destroyed by a large meningioma of the olfactory groove and the right prefrontal lobe was amputated to gain access to the tumour. The patient subsequently was explosively irritable, given to vulgarity, and showed difficulty in synthesizing or in remembering more than one detail at a time.

All this has been surveyed in admirable fashion by Hebb (1945) in the light of the readjustment of the famous "K. M.," in whom the frontal poles had been destroyed by a fracture. In the first report, one year after the operation, "K.M." was described as childish, obstinate and destructive. Six years after the operation she had become normal in every way. Hebb points the moral of this remarkable case, and discusses the methodological difficulties in analysing cerebral functions. It is always difficult to estimate the anatomical extent of destruction, and even more difficult to be certain about the pathological processes at work. Pathological changes continue after the operation, and it is difficult or impossible in these cases to be sure whether behaviour abnormality is due to loss of the tissue removed or to disease in that part of the brain which remains. He summarizes the position by saying that the

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evidence for intellectual and moral defect after surgery of the frontal lobe due to the surgery alone is poor. He believes that this reasoning applies with equal or greater force to leucotomy.

Turning now to personality change after leucotomy itself, Freeman and Watts in their monograph (1942) describe inertia, lack of ambition, reduced self-consciousness, talkativeness and poor judgment in patients in whom the operation has been performed. They described a condition which Cobb has summarized as " fat, lazy, tactless and a little silly." However, they observe that considerable improvement may occur, and that such improvement may go on for years (Freeman and Watts, 1944). Cobb himself (1944) doubts whether any specific traits are lost, believing that the effect of the operation is to reduce the number of possible circuits for association.

Loss of the abstract attitude (Goldstein, 1942) has been considered in some detail by various authors because of the findings after brain injury, particularly in war. Halstead (1940) had found disturbed categorical thinking when the Rorschach and Binet were normal, though he states (1946) that this is not found after leucotomy. Kisker (1944 *a* and *b*) believes that this disturbance, when present, is an outgrowth of the psychosis, and exists before leucotomy is performed at all. Golla (1946) reports the objective mentality of these patients, and their ready response to environmental variations associated with little interest in remote possibilities. At most he says they are a little ruder and a little less sensitive to the feelings of others. The most notable feature he finds to be the absence of anxious self-questioning as to the ethical rightness of projected activity. He finds the patient guided by a conventional moral code which is not coloured by the usual emotional concomitants. He emphasizes, however, the flexibility and wholeness of the nervous system, and raises the point as to how completely these deficits repair themselves in time. With this in mind he lays great stress on the importance of after-treatment.

Results.

Before considering the problem of personality change in the series under review, the results of the operations may be set out simply in tabular fashion. Three broad groups have been established, and the meaning attached to each may be briefly explained. By " excellent " is meant a degree of recovery as judged by personal examination, and by the reports of those with whom the patient lives and works, which is indistinguishable from normality. By " good " is meant that the patient could support himself, and live an essentially normal life, but that there is still evidence of some clinical abnormality. In this group would be included, for example, a patient whose depression had been cured, but who showed undue and hypochondriacal concern about himself. It would in general mean the presence of symptoms without appreciable loss of social efficiency. " Poor " means that despite the ability to live outside hospital—which is more often a function of the family than of the patient—he is not an efficient social unit. The patient does not work at all, or misses much time, or has taken work of a standard much below that which he was able to do before his illness. This latter group includes patients who would

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still be in hospital if their families were unable or unwilling to care for them, and hence in the third table, cases labelled poor have been joined with those remaining in hospital and described under the new heading of "failure." "Success" in this connection is the sum of the cases falling in the categories "excellent" and "good."

The results in these 59 cases were as follows:

(1) Cases discharged from hospital:

Diagnosis.	Excellent.	Good.	Poor.	Total.
Depression	7	4	2	13
Paranoid schizophrenia	3	2	1	6
Hebephrenia	—	1	—	1
Catatonic schizophrenia	—	1	1	2

(2) Cases remaining in hospital:

Diagnosis.	Improved.	Not improved.	Total.
Depression	5	4	9
Paranoid schizophrenia	2	2	4
Hebephrenia	4	10	14
Catatonic schizophrenia	2	8	10

Taking the two tables together and combining those described as excellent and good under the heading successful, and combining poor with the groups still in hospital, we have:

Diagnosis.	Success.	Failure.	% Success.
Depression	11	11	50%
Paranoid schizophrenia	5	5	50%
Hebephrenia	1	14	6%
Catatonic schizophrenia	2	10	20%

Personality.

The possibility of personality change was considered with great care in the eleven cases of depression who made excellent or good recoveries. Only in these cases was it considered that there was a reasonable certainty that detectable personality changes would be separable from the effects in residual symptoms of the illness. The eleven case-histories would make unreasonable demands on space, and a representative history must suffice. It may be stated at once that none of the seven excellent recoveries showed any sign of personality change, and of the cases regarded as good recoveries, two were equally free from any appreciable alteration. Of the first group the following is a representative case:

Case 17.—This patient had had a breakdown in August, 1935, when he was 30 years of age. He attempted suicide by drowning, following a severe depression of some months, during which he had been drinking heavily. On admission to hospital he was dull and conversed hardly at all; he believed everyone, including the staff and his relatives, was against him, and at times he became obscene and generally offensive. During the next five years he gradually sank into a dull, apathetic

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state and muttered unintelligibly. He was described at one time as showing flexibilitas cerea. At the end of 1941, six years after his original breakdown, prefrontal leucotomy was performed. Six months later he was described as well behaved, but lacking in initiative, able to converse only a little, and as making very little attempt to occupy himself. A year later he was discharged, being at that time described as bright and cheerful, and confident about the future. After his discharge his conduct tended to be a little erratic and he drank a good deal. After a few months, however, he settled down and gradually improved. He is now employed as a salesman and doing very well. He is described by all who know him as completely fit and very efficient at his job. He is well mannered, with a ready flow of talk, brisk and alert, and shows a grasp and knowledge of the market in which he is interested, which is obviously of high quality. He is paid a salary which even in these days of inflated wages is an index of the regard in which he is held by his firm. He never gets depressed, and though he is irritable at times, this appears to be nothing more than is normal in the present state of the world. He says he has no greater confidence in himself than he had previously, and still has to struggle to overcome his natural self-consciousness when making a sale. His affection for his family is quite unchanged, and he has made such provision for his future as would be expected in a prudent man of his age.

The two good recoveries who showed some evidence of personality change will now be described.

CASE 20.—This lady was admitted to hospital in August, 1943, when she was aged 30. She had had a depressive illness six years before, which lasted for about six months. Apart from this she was a capable woman, of bright and happy temperament. This illness began fairly acutely, and on admission she was dull, indifferent and very restless; she did not converse at all spontaneously and was slow in answering questions which were put to her; she cried almost continuously, stating she was tired of life and she was in general severely depressed. It was thought that she was hallucinated, for she was stated to have said that she heard God tapping on the walls and heard him say to her," Come to rest." In March, 1944, when her condition had deteriorated further, prefrontal leucotomy was performed. She was discharged four months later, and her relatives said that improvement continued for the next six months. At first she was subject to what were called " brainstorms "—an explosive irritability in response to environmental frustrations. She was handled, however, with tact and understanding by her family, and in recent years she has regained what the family consider to be full normality. It was clear, however, on examination that there was a certain loss of initiative and considerable lack of concern about future events. She was dealing very effectively with the present, but was letting life flow by her. It will be observed that the symptomatology shows some schizophrenic features, and it seems likely that such personality change as exists is related to this.

CASE 19.—This patient was admitted to hospital early in 1941, when she was aged 25. She was a single woman, who had lived with her mother, and was described as energetic, sensitive and highly strung. She had had a breakdown in 1938, which lasted for nearly a year. She had never fully recovered, and had been depressed, with a conviction that she had sinned. She felt unfit to go to church or to make her confession, and became very distressed, wandering continuously about the house, wringing her hands. She lost interest in her work and herself, and wished to die. She showed gross motor retardation on admission, and could give very little account of herself. She refused food, and although her symptoms were alleviated by electro-convulsive therapy, relapse occurred after a week or so. In January, 1944, more than five years after the illness began, prefrontal leucotomy was performed. Improvement showed itself almost immediately, and she was discharged three months later, regarded as recovered. She was described by her relatives as bright, alert and cheerful, and she found as much comfort in her religion as she had before her illness. On the other hand, she did less work than before the operation, and apart from a little cooking and cleaning, she tended to sit about the house doing nothing. She was previously extremely conscientious and fastidious both about herself and her surroundings, but is now inclined to be slack and careless in both respects. She is rather inclined to resent interference or criticism,

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and is satisfied with herself to a degree that is not borne out by her performance. She tends to lie in bed late in the morning, and one of her sisters summed up the situation by saying that she was thoroughly pig-headed. This account was borne out by clinical examination. She was a careless and rather indifferent philosopher, enjoying life on a cognitive level, and well satisfied with herself and her performance. There has been no recurrence of the depression.

This is the only example in the series of an apparently pure affective illness in which a residual personality change could be detected. It would appear to be a true bill, and to be related to the leucotomy. The possibility of schizophrenic features in the original illness must arise of course, but the author was unable to satisfy himself on the point so long in retrospect.

Thus in eleven cases, nine showed no sign of personality change, and of the two who did show such change, this was in one case thought to be related to the schizophrenic colouring to the illness. There was no indication of inertia, for all were working productively and as well as before the illness. A reasonable and appropriate self-consciousness can be developed by any of them, it is considered, on the scale and in the circumstances that would have sufficed before the illness. None was apparently an embarrassment because of lack of social judgment, and indeed the "fat, lazy, tactless and silly" syndrome was not evident at all, except that many of them had in fact gained weight. This is not to say that defect had not *been* present, for it is clear from the histories of many that there had been difficulties in adjustment in the first year or two. But it seems clear that reorganization, given adequate time and good surroundings, can progress to the ultimate degree with a restitution that appears to be total. The importance of a good home environment, or in its absence, purposive rehabilitation needs no stressing; and it must be remembered that full recovery, as in some of these cases, may take two or three years.

Symptomatology in Depressives.

Scrutiny of the case-histories of the seven cases assessed as excellent shows the following features present in all:

(1) Good personalities and fairly good work records prior to illness.

(2) Average intelligence or above and an absence of secondary dementia.

(3) A low incidence of hypochondriasis which, if present at all, was recent, not very prominent and not of delusional intensity; in particular, the hypochondriasis was never bizarre.

(4) An absence of schizophrenic features, especially hallucinations and passivity.

(5) Neither the length of the illness nor the age of the patient were consistent.

The four cases described as good showed the following features:

Case 4.—The personality here was distinctly unstable, though the work record had been fairly good. The patient had been known as domineering and defiant, addicted to drink, and had frequently taken drugs to bring on miscarriage. She had always been a hypochondriacal personality, and this is still evident, though without any effective disability.

Case 5.—This patient, too, had been described as "always ailing" and had been an insecure and dependent individual. In her case, too, her efficiency was good, though she still tended to regard herself as a semi-invalid and to make considerable demands on those who lived with her.

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CASE 19.—This case is reported above.

CASE 20.—This case shows schizophrenic features with hallucinosis, and a tendency for the hypochondriasis to be rather bizarre in quality.

The results categorized as poor were two in number, and showed the following:

CASE 15.—This man's father died in a mental hospital, and during his school days he was continually in bad health. He never learned to read or write, and was an unsociable, petulant dullard, with an ingrained habit of grumbling. Hypochondriasis was severe during his illness. Although now able to live at home he is still disgruntled and unco-operative. He changes his work continuously to branch out into unproductive schemes, such as breeding rabbits, and none of these schemes are ever pursued with any success. He says he feels more dead than alive, and is constantly blowing up, losing the feeling in his fingers, and suffers burning inflammation all over his body. His family say he is incapable of worrying about anything, but will talk for ever about his complaints.

CASE 1.—This case is described below.

The depressives who still remain in hospital show the following features:

CASE 28.—A marked arteriosclerotic dementia.

CASE 29.—This patient had been 13 years ill, and the illness showed marked paranoid features. Considerable secondary dementia is evident.

CASE 36.—Hypochondriasis was severe and bizarre. She said that her body was filled with chalk, and the only treatment that would help her would be to burn her with red hot pokers, or to file her body away. She felt sure that God had condemned her to live for 5,000 years as a punishment.

CASE 37.—Marked secondary dementia.

CASE 40.—Hallucinosis was marked in this case. She was 62 on admission.

CASE 43.—In this case also the patient complained of the devil swearing at him and telling him he would never get well. He continues to say that he is not alive, as he was hanged in gaol long ago; the person talking to the examiner is the devil himself. He was 56 on admission.

CASE 46.—A very insecure personality with a long history of hypochondriasis, which symptoms were more marked when his illness developed.

CASE 54.—Hypochondriasis was very marked. She complained of her inside falling to the ground every time she stood up. Schizophrenic features were prominent.

CASE 56.—Agitation was extremely prominent, and secondary dementia became very marked later.

SYMPTOMATOLOGY OF SCHIZOPHRENICS.

In only one case of hebephrenia and one case of catatonic schizophrenia could the result be classified as successful, and these may be briefly disposed of.

The hebephrenic had been ill for just over a year when the operation was performed, and interesting features were the excellence of the home surroundings and the fact that she had made a recovery six years before from a brief schizophrenic illness. Her parents took enormous trouble with her, and appear to have directed her rehabilitation along excellent lines. She was encouraged in her hobbies, was given reasonable freedom, and arrangements were made for her to attend evening classes and have private tuition. She is content and placid, and holding down a secretarial post with success.

The catatonic case showed a similarly favourable home environment and improvement had been very slow. A placid and rather inert individual resulted, but again social efficiency was reasonably good.

The paranoid schizophrenics are a rather more important problem in this series, as in three cases the result was regarded as excellent. The distinguish-

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ing features between those who have recovered and those who have not are not as clearly marked as in the case of the depressives, but certain tentative observations can be made.

The three cases classified as excellent were :

CASE 7.—The personality here was excellent.
CASE 9.—Depressive features were very marked indeed during the illness.
CASE 18.—The personality was very good.

The cases classified as good were :

CASE 12.—The result here was one of placid and cabbage-like inertia, but with reasonably effective social adjustment. Nevertheless the case is rather an extraordinary one, as the history will indicate. The patient was admitted to hospital in 1936, when she was 26 years old. She had become introverted and preoccupied with religious matters and with psychology for some time. Quite rapidly she sank into a dull, indifferent condition, punctuated by outbursts of impulsive violence. She was obviously hallucinated and was very destructive. Her habits became faulty and she relapsed into a state of inactivity. She became more active later, and developed the symptoms of florid paranoid schizophrenia. At the end of 1943 prefrontal leucotomy was performed, nearly eight years after her illness began. She gradually improved, and enormous efforts were made on her behalf by the hospital staff. A year and a half after operation she was discharged and since then has lived at home, giving effective help in the house. Apart from her inertia she maintains good contact with her environment, and when seen she made some penetrating criticisms of the food situation, and showed a detailed knowledge of the regulations governing the rationing of food. She is symptomless.
CASE 3.—This was somewhat similar to Case 12.

Of the cases classified as failures, one was living outside hospital and four were still in-patients. The first of these was a nervous, shy, paranoid personality as far back as his development could be traced. In all four cases remaining in hospital passivity was a marked feature.

It is clear that leucotomy offers little hope of recovery in chronic catatonia and in hebephrenia. It seemed in this series that a bad prognosis is associated with a high incidence of passivity, with early confusional pictures and with a pseudo-neurotic onset. In the main, of course, these features correspond with the types of schizophrenics known to have a bad prognosis quite apart from leucotomy.

RETURN OF SYMPTOMS.

Return of symptoms after apparent cure has seldom been reported, and the following case is of some interest :

CASE 1.—It was said that symptoms had been developing for some nine years before admission in 1940, when the patient was aged 33. He was described as morose and unsociable, and had become progressively more concerned with the possibility of his suffering from some serious disease. He had been treated by his own doctor for many years. He refused to allow the wireless to be turned on in his presence, and could not bear any clock in the house to strike. Just before his admission he had been staying in bed all day except once a week, when he got up and went out for a hair-cut. Recently he had begun to refuse food. He made no improvement and, early in 1942, 18 months after his admission and some 11 years after the onset of the illness, prefrontal leucotomy was performed. Three months later he was described as working well, happy and free from symptoms. He was discharged five months after the operation, and his recovery very soon became complete. He put on a good deal of weight, returned to work, and has held the same job during the last five years, and has apparently given complete satisfaction. He married two years

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after his operation, and the marriage appears to have been a complete success. His wife describes him as having been a cheerful and amiable partner, very considerate and thoughtful, and everything she could desire. This happy state of affairs, however, was only continued until about a year ago. Since then he has begun to feel that his brain is working all the time, and he counts every footstep he takes. He is acutely unhappy unless he puts books down in exactly symmetrical fashion. He cannot bear to shave unless his routine is absolutely fixed and unalterable. He finds that he must adjust his tie when starting a new task, otherwise he becomes uneasy. His evenings now are spent unhappily, for he finds himself ruminating on what he has done during the day and wondering whether he has left undone any of the things he ought to have done. He feels fearful about his ability to cope with the morrow. At the same time he has lost all his fears about his physical health, and distinguishes quite clearly his feelings of uneasiness from depression, from which he now never suffers.

On reviewing the history, it is difficult to be certain whether the diagnosis would not more properly have been described as an obsessional neurosis. Certainly his condition at the present time is that of an obsessional state. It is interesting to observe the complete cure which followed the operation with the gradual reorganization of his basic personality pattern, followed by the reorganization of the morbid pattern which characterized his illness. A similar state of affairs was observed in cases Nos. 16 and 22. In the former of these a paranoid schizophrenic, after a slow recovery, gradually developed his illness again in much the same way as on the first occasion. In Case 22, a catatonic schizophrenic, after nearly three years' excellent adjustment, during which she returned to full-time employment as a nurse, gradually disintegrated and is now as ill as on the first occasion. It is clear that the concept of the brain as a whole organ leads not only to the recognition that the personality may be reorganized after the operation, but that morbid patterns which have been well stamped in may re-assert themselves. Over a period which is admittedly much longer it is quite possible that leucotomy may produce cures which are limited in duration, as are those of E.C.T. and other physical methods of treatment.

Discussion.

It seems reasonably certain then that personality change after leucotomy and ascribable to the operation alone is not permanent, and given cure of the illness and reasonably good rehabilitation, a restitution of the premorbid personality may be expected. Full restitution will, however, take time, and may require as much as two or three years. If surroundings at home are good then discharge from hospital as early as possible seems the obvious course, with the provision of such help as is possible from out-patient services, and assistance in placing in suitable employment. If the home is bad and the patient likely to be unwelcome or neglected, then rehabilitation of a purposive kind in hospital should be continued for a year or more.

In the matter of prognosis, no generalization can be made here either about diagnostic groups or their subdivisions. The figure given here for example, that in 50 per cent. of depressive cases success followed operation, can be of no general importance. In the first place the series is relatively small, and secondly no indication is given here—nor would it readily be available—as to how these cases were selected for operation. Nor is it clear how representative

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the series is of the class of depressives as a whole. With these limitations in mind, however, certain tentative conclusions may be drawn.

In depression, a good personality, free from lifelong morbid patterns of reaction, and average intelligence is essential if a good prognosis is to be given. Heavily emphasized hypochondriacal reactions or bizarrerie are bad omens, and equally so are schizophrenic features and organic dementia. In the case of hebephrenic and catatonic reactions, it seems doubtful whether the operation is worth doing unless circumstances are quite exceptional; in paranoid schizophrenia the operation seems to offer reasonable hope if the pre-morbid personality was good, and particularly if passivity and catatonic features are not prominent.

It is well to remember that the curative effects of leucotomy may not be permanent, and the reorganization of disease patterns shown in three cases in this series, after a long period of comparative fitness, may prove to be a not uncommon phenomenon with longer observation.

Summary.

1. A series of 59 cases on whom prefrontal leucotomy has been performed has been surveyed.

2. It is believed that no permanent personality change occurs which is ascribable to the operation alone. Restitution may, however, be slow, and its speed depends materially on the possibility of rehabilitation, particularly in the patient's own home.

3. Factors are indicated which appear to correlate with recovery, and others which appear to be associated with failure.

4. It is noted that an apparently perfect cure after leucotomy is not always permanent, even when maintained for some years.

I have to thank Dr. R. E. Hemphill, Medical Superintendent, for permission to publish the paper. The task of tracing these patients, some of whom had moved several times during the war, was an arduous one, and my warmest thanks are due to Mrs. M. I. Grant and Mrs. M. Crotty for their perseverance and patience during the investigation.

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DELINQUENCY AND EPILEPSY: A CLINICAL AND ELECTROPHYSIOLOGICAL NOTE.*

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THE neuropsychiatrist presenting evidence before Court will sooner or later be asked the question, "Was the accused, at the time of committing the offence, labouring under such defect of reason as that he did not know what he was doing, or if he knew what he was doing, he did not know it was wrong?"

Two points of difficulty arise within the question which may be susceptible of clarification: the third remains elusive.

The first lies in the phrase "at the time of committing the offence": the second in "that he did not know what he was doing."

To both these points an answer may commonly be given, though probably in the form of a reasoned inference based on the facts emerging on examination.

Discussion of the attitudes implicit in the third phrase, "that if he knew what he was doing he did not know it was wrong," may involve a disquisition on the accused's appreciation of morality which is fraught with difficulty, and where concise interpretation remains elusive.

When a medical witness can give it as his opinion that an accused person is suffering from epilepsy or some other recognized mental disorder the Court will commonly accept that evidence in mitigation of the offence.

It should never be forgotten that the function of a witness is to offer his evidence, based on such examination as satisfies him—if necessary in the form of reasoned inference from observed facts—while the onus of acceptance or rejection of such evidence and the decision as to the disposal of the case falls entirely upon the Court.

In an attempt to study further the evidence required to answer questions relating to a person's knowledge "of what he was doing" "at the time of committing the act," 140 records of persons of all ages and both sexes were reviewed.

The subjects had been referred for examination following an anti-social act varying in gravity from "being beyond control" to "attempted murder."

Careful study has been made of the electro-encephalographic records of these persons under conditions of "rest" and "stress."

The full investigation of such a case necessarily involves electroencephalographic studies paralleled by biochemical and psychiatric investigation spread over a period of time and conducted within a controlled environment throughout (Hill, D., and Sargant, W., 1943, *Lancet*, and Sessions Hodge, *J. Ment. Sci.*, 1945, **91**, 385), but the curtailed examination detailed here has been found to yield suggestive results.

* A Paper read at the Quarterly Meeting of the Royal Medico-Psychological Association, Gloucester, on 14 May, 1947.

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For the purpose of this inquiry attention was directed to those cases which could be considered "epileptic": firstly those on "clinical" grounds, secondly those on "biochemical" grounds, and thirdly those on "electrophysiological" grounds.

TABLE I.

Total Records.

Children ("Children and Young Persons Act").		Adults.	
Normal	24	Normal	25
4–7 c.p.s.	33	4–7 c.p.s.	21
"Epileptic"	33	"Epileptic"	4
Total	90	Total	50

Full total, 140.

TABLE II.

"Epileptic" Records.

Children.		Adults.	
Clinical fits	10 (7·1%)	Clinical fits	1 (0·7%)
Loss of consciousness	5 (3·5%)	Loss of Consciousness	1 (0·7%)
"Epileptic" records	18 (12·8%)	"Epileptic" records	2 (1·4%)
Total	33 (23·4%)	Total	4 (2·8%)

TABLE III.

Age Groups in Years.

	<6.	6–10.	10–14.	14–17.	17–25.	>25.
Clinical fit	3	1	4	2	1	0
"Loss of consciousness"	0	3	2	0	0	1
"Epileptic" record	0	5	11	2	2	0
Total cases	3	9	17	4	3	1

The first group satisfied the criterion that they had had one or more observed and recorded clinical fits, either "major" or "minor." This group showed an EEG record characterized by either a peak of energy in the 1·5–4 c.p.s. band which became dominant during hyperpnoea, spread to both frontal areas and persisted for 20 seconds or more following the cessation of hyperpnoea, or a typical "spike and wave" complex with associated spectrum analysis. This group represents 7·8 per cent. of the total.

The second group, none of whom had ever—so far as inquiry could elicit—had a clinical fit, suffered a clouding, diminution or loss of consciousness during hyperpnoea. The onset of this state—characterized by failure to respond to a simple and clearly given command—was preceded for 2 seconds

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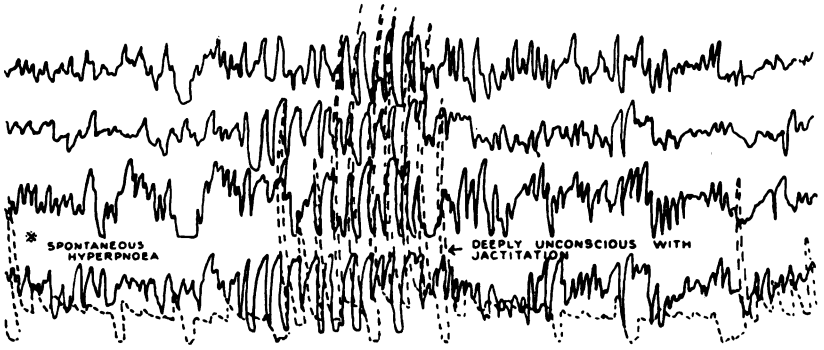

PLATE A.

Example of "loss of consciousness" in a subject referred for repeated delinquencies and "being beyond control"—episodic acts of violence but *no* clinical "fit" ever reported or observed prior to examination. (Trace 2 analysed).

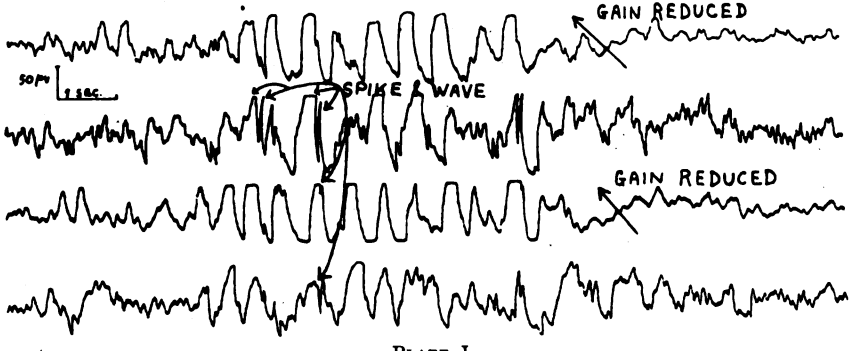

PLATE I.

Example of "spike and wave" record in primary E.E.G. trace. History of repeated delinquencies and larcenies, breaking and entering, truancies and "being beyond control." *No* history of "fits" obtained: minor attacks subsequently observed when under observation on remand.

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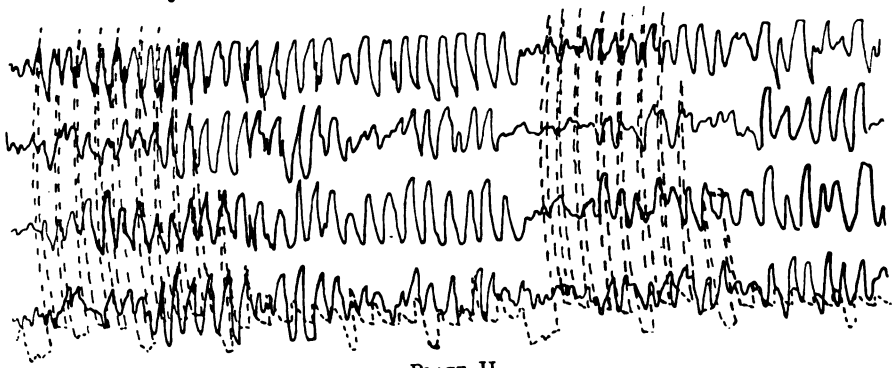

PLATE II.

Example of wide spread of energies in primary trace as shown in analysis with developing "spike and wave" complexes. History of repeated delinquencies and some violent outbursts at school. *No* history of "fits" obtained on enquiry and no clinical fit observed. (Trace 2 analysed).

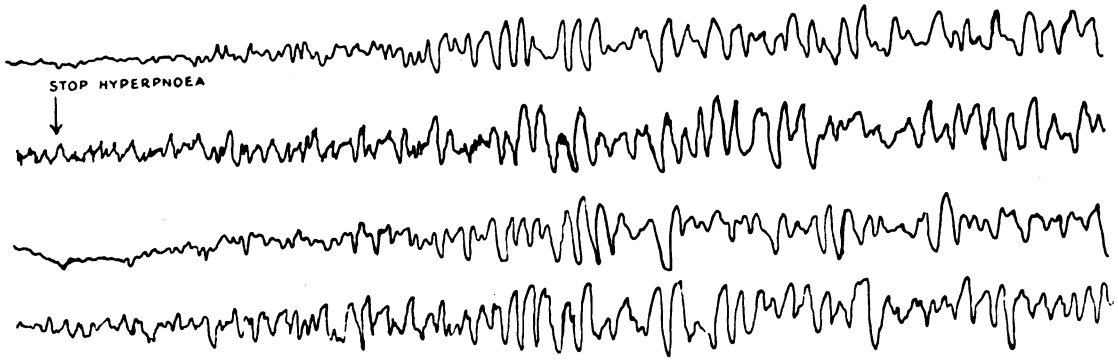

PLATE III.

Example of developing high voltage slow waves which persist for 30 seconds or more. History of repeated delinquencies and a head injury [illegible]

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by the appearance in the primary EEG trace of a complex of high voltage waves at about 1·5 c.p.s. which persisted during the phases of disturbed consciousness. The repetition of the record following the ingestion of 50 gm. of glucose modified the record in that consciousness was unimpaired during hyperpnoea, and the appearance of complexes of frequencies in the 1·5–4 c.p.s. band did not occur. Yet the EEG record remained abnormal in that slow frequencies in the 4–7 c.p.s. band remained unaffected and of dominant energy (Plate A).

It is suggested that this group of persons, representing a further 4·2 per cent. of the whole group, might properly be regarded as epileptic pending a more critical examination and definition of "epilepsy."

In the third group (14·2 per cent. of the total) no clinical fit had ever been observed, no diminution, clouding or loss of consciousness could be demonstrated on examination, fasting and/or with hyperpnoea, and the criteria accepted have been purely electrophysiological. The examination in every case was made using a 2 or 4-channel electroencephalograph with standard bipolar electrode placements, the primary tracing being subjected to frequency analysis with Grey Walter's Electronic Wave Analyser in the case of the 4-channel machine. The machines used were the 4-channel EEG at the Burden Neurological Institute—where the bulk of the work was done—and a 2-channel portable machine made available to the Neuro-Psychiatric Department at Musgrove Park Hospital through the courtesy of Dr. Grey Walter. For purposes of inclusion in this group it was required that the EEG record should show:—

(1) A typical "spike and wave" primary trace accepted as evidence of *petit mal*;

or (2) a wide spread of energies in the primary trace on electronic analysis with developing "spike and wave" complexes during and following hyperpnoea;

or (3) activity in the δ and θ bands at rest with the development of high voltage waves in the 1·5–4 c.p.s. band which persist for 20 seconds or more after the cessation of hyperpnoea following the ingestion of 50 gm. glucose (Plates I, II and III).

The comparison of control groups produces the following figures: satisfactory figures for the incidence of "epilepsy" in the general population are difficult to obtain. Turner (quoted by Kinnier Wilson) gives 2·9 per thousand as the incidence in Great Britain—it is doubtful if this is a sufficiently high figure. Penfield and Erickson for the United States give figures of 1·2 per thousand (S. Dakota), 6·2 per thousand (Nassau County), 12·7 per thousand (Vermont), with 5·0 per thousand as the general incidence for the United States of America. They also state that in Korea—with a markedly inbred population—the figure rises to 23·8 per thousand. Accepting the mean of these figures as 12·5 *per thousand* it will be seen that the figure of 7·8 *per centum* is still significant. While if the total figure of 26·2 per cent. can be accepted it suggests that the incidence of "epilepsy" amongst delinquents is indeed high.

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Comparison with further control groups has been made. Dovey (*Proc. E.E.G. Socy.*), in a study of EEG records of 106 unselected normal children aged from 6 months to 10 years, stressed the difficulty of interpreting these "young" records in the light of experience with adults, but states (private communication) that in spite of the occurrence in this group of records showing many "anomalies and 'instabilities'," only two records were considered to be of the "epileptic" type. It is perhaps of importance to state that, of the three children whose cases are reported here in the "under 6 age-group," all had clinical fits. Records have been taken of an unselected group of 100 schoolboys aged 11 to 18 years. Of these 5 (4·5 per cent.), had EEG records which were comparable with those in the third group previously described (Sessions Hodge and J. A. Maddocks).

If the foregoing figures can be accepted it would appear that we have here a group of persons (Table II) subject to episodic disturbance, such disturbance being in the nature of widespread cerebral dysfunction which at some point disturbs cortical integration. This disturbance may be related to consciousness, and, as has been shown, can amount to a diminution, clouding or loss of consciousness. The finer degrees of such a disturbance will need to be the subject of further investigation, and this is projected.

If an accused person is found to exhibit such phenomena, it should be possible to infer that "at some material times" he was in such a state as "that he did not know what he was doing." If by careful reproduction of the alleged circumstances of the crime it can be demonstrated that the necessary factors favouring such an episodic disturbance were present (if, to borrow a phrase from the old Astrologers, "the required [aetiological] constellation were in conjunction"), then one might reasonably infer that "at the time of committing the act" the accused "did not know what he was doing."

The third point remains elusive—"that if he knew what he was doing he did not know it was wrong."

An appreciation of right and wrong must surely involve many factors in the individual's internal and external environment: constitution, birth, upbringing and intellectual endowment being but some. Sherrington has said that "what the mind is concerned with is not the act but the aim" (Sherrington, *Man on His Nature*). There is a wide gulf fixed between the act of pulling the trigger by flexion of a forefinger and hitting the target, with all that that implies in consequence.

It is possible that we are concerned not so much with a lack of knowledge of right-doing and wrong-doing as with faulty inhibition, and that further light may be thrown upon this with the extension of investigation in frontal lobe function.

It is possible also that delayed or disturbed cerebral maturation is another cogent factor. This may account for the higher incidence of the observed disturbance in the juvenile groups. Should this prove to be so then yet another reason is added to the many in favour of extended observation, control and treatment of the young delinquent, and further reinforces Prof. D. K. Henderson's plea for "an indeterminate sentence, discharge to be dependent not upon the expiration of time but upon the proper establishment of adequate

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social patterns." In this plea I concur, and would stress the value of repeated coincidental psychiatric and electrophysiological examinations.

One may perhaps add that even so restricted a study as this clearly indicates the need for further research and contemplation.

The electro-encephalographic findings are, after all, a graphic representation of electrical activity of cerebral tissue. They require to be considered together with both biochemical and psychiatric estimations in every case.

It would be improper at this stage to speak of an "epileptic record" save with the reservation that the nature of "epilepsy" is not yet understood, and that lacking the evidence of a "seizure," we can only state the nature of the electro-encephalographic findings and await their association with other morbid phenomena.

Investigation of the delinquent's appreciation of "morality" probably poses the most difficult question.

Trotter in his paper," Has the intellect a function ?" speaks of the "calibration of the intellect," thus indicating the need for a positive effort at attaining functional cerebral unity. If this desideratum be possible it will surely imply the possession of adequate neuronic substrate not liable to episodic disturbance.

Finally, let it be re-emphasized that this communication should be regarded as tentative and indicative, and that—to quote Trotter again—" . . . the man of science within his own, often narrow, department can cheerfully view all his knowledge as provisional only and indefinitely liable to subversion by further inquiry. . . "

It is my pleasure to thank Dr. J. F. Davidson, Medical Officer of Health, Somerset County Council, for the use of case-material, my colleagues Dr. and Mrs. Grey Walter for their encouraging help on all occasions, and lastly Professor F. L. Golla for his unfailing and stimulating encouragement and bracing criticism.

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SUGGESTIBILITY AND PERSISTENCE IN EPILEPTICS AND MENTAL DEFECTIVES.

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(1) INTRODUCTION.

IN recent years many attempts have been made to improve methods of temperament testing, and to show the validity of the results by comparing test-scores of groups of subjects known to be differentiated with respect to certain traits (Cattell (1), Eysenck (2), Himmelweit (5)). Thus there has been found a very significant correlation between degree of neuroticism and suggestibility, and a correlation almost as high between degree of neuroticism and persistence. These results have suggested the possibility of using tests of this kind in an attempt to measure the neurotic tendencies of individual subjects and to screen the more neurotic from types of occupation likely to impose too great a strain on them (Eysenck (3)).

Such a plan is feasible only on condition that the tests are able to discriminate not only between normal and neurotic subjects, say, but also that they should discriminate between neurotic disorders and others which are not being investigated. In other words, tests, in order to be maximally useful, must be specific: they should measure one factor, trait or ability only, and not a mixture of different and diversified characteristics. Thus if it should be found that suggestibility is heightened not only in neurotics, but also in psychotics, mental defectives, epileptics, etc., the value of the test as a measure of neuroticism would be seriously impaired. Previous work has shown that psychotics do not react to the suggestibility test in a manner similar to neurotics (Williams (9)); the present report is concerned with the behaviour of epileptics and mental defectives.

(2) THE EXPERIMENT.

Clinical studies of the behaviour of epileptics and mental defectives have led to certain conclusions regarding the extent of their suggestibility and persistence; for example, it is widely held that the "ready suggestibility" of mental defectives may lead to their committing criminal offences through their becoming the dupes of people with more astute minds. Regarding the personality traits of epileptics opinions vary and are sometimes apparently contradictory: "He (the epileptic) gets his own way by persistence or by a fixed attitude of non-co-operation" (Clark (6)); "He has no tenacity of purpose although his verbal ambitions are boundless" (Clark (6)). It would be interest-

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ing to investigate these two temperamental traits experimentally, in so far as they are accessible to experimental study.

From the results of previous experimental studies some investigators have come to believe in the existence of different types of suggestibility. As many of these studies used rating scales and questionnaires as validating criteria some doubt has been cast on their validity. For the purpose of experimental investigation it seems desirable that a test of suggestibility should take the form of a controlled situation in which the subject is given a suggestion and it is observed whether or not his behaviour is affected by it.

Many tests of this type have been devised, the earliest being "Chevreul's Pendulum" test, in which the subject is asked to hold a small weight suspended from a string over a line drawn on the table. He is told that the weight will begin to swing along the line. The extent of the arc which the weight describes while the subject is holding the string constitutes his score for suggestibility. The basis of this and other ideo-motor types of suggestibility test is that the suggestible subject, on having it suggested to him that a certain movement will take place without his conscious participation, is led to execute that movement unconsciously. Another widely used test of this ideo-motor type is Hull's Body Sway test, in which the subject is told to stand quite still and relaxed while a gramophone record of a repeated suggestion is played to him: "You're falling forward; you're falling forward all the time; you're falling forward now . . ." The amount of sway consequent on the suggestion of the record is measured in inches, and constitutes the suggestibility score of the subject. This test has been found effective for use as a screening test for neurotics, differentiating successfully between normal and neurotic subjects. It has been established that neurotics are significantly more suggestible than normals, and that, contrary to a widespread impression, hysterics are not more suggestible than other neurotics (Eysenck (2)).

In this study, by applying Hull's Body Sway test to a group of epileptics and mental defectives it is expected to establish whether they are significantly more prone to be affected by primary suggestibility of the ideo-motor type than the normal population. The suggestibility observed by the clinician may be a complex of several factors, and the relation of the suggestibility tested by the test to the general concept "suggestibility" remains to be carefully examined.

Regarding the nature of the trait "persistence" opinions are divided. Some writers (Ryans (7)) incline to the view that there is a general factor of persistence; Thornton and Guilford (8) report results favouring a multiple factor theory. A simple test of persistence is to measure the length of time for which the subject will maintain a painful or fatiguing posture, being free to abandon that posture whenever he pleases. "However the evidence regarding the existence of a general factor covering the whole field of persistence may be evaluated, there is little doubt that various tests involving the continuance of bodily posture in spite of fatigue and pain induced by that posture correlate together, and define a group factor which can be measured with relative ease" (Eysenck (2)).

In the test of persistence used in this study the subject was seated in a

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chair and instructed to hold one of his legs extended over the seat of another chair. He was instructed to hold his leg up as long as possible, and the time elapsing until his heel touched the seat of the chair was recorded in seconds.

(3) Description of the Population Tested.

106 male mental defectives, 94 female mental defectives, 13 male mental defectives classed as " difficult " (behaviour problems, possibly psychopathic), 100 male epileptics, 100 female epileptics, were tested individually with these two tests.

In the mentally defective group the average age of the female patients was 29·5 years, range 17–56, average age of male patients 37·9 years, range 17–59. The patients were chosen from the I.Q. range 50–70 and were capable of understanding simple instructions. The " psychopaths " (this label was only tentatively applied) were cases showing gross disorders of conduct, most having a record of conviction for some offence and all difficult to handle, their behaviour tending to indicate that some defect of personality might be superadded to their defect of intelligence.

In the epileptic group the average age of the female patients was 33·4, range 17–58, the average age of male patients 36·6, range 18–52. The patients selected were epileptics otherwise normal; feeble-minded, deteriorated, psychotic and neurotic cases were excluded.

(4) Results.

The histograms below illustrate the distribution of the suggestibility scores of the mental defectives and epileptics; the histograms of a group of 100 normal subjects and of 1,230 neurotic subjects investigated by Eysenck are shown alongside. The resemblance of the histograms of both sections of the experimental population to that of the control group of normal subjects and their difference from that of the neurotic group are striking.

The results were as follows:

Body Sway test (excursus measured to the nearest inch):

Mental defectives:

Mean score, male 1·22
" " female 1·17 } mean score M.D. 1·19 ± ·37.

Epileptics:

Mean score, male 1·43
" " female 1·43 } mean score Ep. 1·43 ± ·94.

Statistical investigation of these scores showed that neither of the experimental groups was more suggestible than the control group. Applying the χ^2 technique to the scores of normals compared with those of epileptics and mental defectives the results were:

Normals compared with epileptics: $\chi^2 = 2{\cdot}38$ (d.o.f. = 3).
" " defectives: $\chi^2 = 2{\cdot}95$ (d.o.f. = 3).

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There was no significant difference between the scores of epileptics over and epileptics under the median age. Similarly, with the mental defectives, there was no significant difference between the older and younger.

Comparing the total epileptic with the total defective population no significant difference was found ($\chi^2 = 1{\cdot}93$, d.o.f. $= 3$); comparing the total male with the total female population a slight significant difference was found ($\chi^2 = 5{\cdot}65$, d.o.f. $= 3$), indicating that the women were slightly less suggestible than the men.

The results of the tests of persistence were :

Mental defectives :

	Seconds.	
Male	120·01	mean score 97·63 ± 20·4.
Female	75·24	

Epileptics :

Male	88·57	mean score 101·44 ± 18·6.
Female	114·32	

These persistence scores are significantly higher than those obtained by A. Petrie from a group of male and female neurotics (Eysenck (2)), showing that this test, like the suggestibility test, appears to be relatively specific for neurotic disorder. Her data were obtained from 25 male and 25 female hysterics, and from 25 male and 25 female dysthymics. The results in seconds were as follows: The two hysteric groups gave average scores of 14·1 ± 9·6 and 13·9 ± 9·7, while the two dysthymic groups gave scores of 29·1 ± 20·8 and 32·5 ± 25·9. Altogether the hysterics persisted for 14·0 ± 9·4 secs., while the dysthymics persisted over twice as long. The mental defectives (average score 97·63) and the epileptics (average score 101·44) showed far greater persistence, but the range of scores was very wide—from 2 to over 800 seconds. The non-significant correlation between suggestibility and persistence scores (−·07 and ·03 respectively for the E. and M.D. groups) showed that there was no tendency for individuals having high suggestibility scores to have high persistence scores, nor for high suggestibility scores to be consistently linked with low persistence scores.

(5) Discussion of Results.

In appraising the significance of the results of the test of suggestibility, it is necessary to consider the relationship of the " suggestibility " which is apparent to clinical observation to the " suggestibility " measured by this test. Is suggestibility in the clinical sense a unitary trait measurable by experimental methods ? Eysenck in *Dimensions of Personality* gives a summary of the findings of earlier workers on this subject. His own work on tests of suggestibility has led him to the conclusion that there is no general trait of suggestibility, but that there are at least two, probably three, main factors in the tests commonly used to measure suggestibility : " Primary suggestibility " of the ideomotor type—its distinguishing feature is " the execution of a motor movement

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by the subject concerned consequent on the repeated suggestion by the experimenter that such a movement will take place, without conscious participation in the movement on the subject's part" (Eysenck (2))—"secondary suggestibility" ("gullibility"); and "prestige suggestibility"—a tendency towards change of opinion following on learning the opinion of someone who has high prestige for the subject. Primary and secondary suggestibility have been shown to be quite uncorrelated and independent (Eysenck (2); Eysenck and Furneaux (4)). The independent position of prestige suggestibility is still doubtful: "It is possible that when this question is tackled experimentally prestige suggestion will show little connection with primary suggestibility" (Eysenck (2)).

It is evident from the results of this investigation that mental defectives and epileptics are no more liable to be influenced by primary suggestibility than normal subjects, and much less so than neurotics. The conclusion is that an integrated personality, even when intellectually subnormal or suffering from a fairly incapacitating organic disturbance, is not on account of such handicaps rendered more susceptible to primary suggestibility. A disturbed personality (psychoneurotic) is distinctly more liable. The results of this investigation therefore confirm the value of Hull's Body Sway test as a screening test for neurosis.

As the independent position of prestige suggestion has not yet been established, it is worth while considering what information these results yield regarding its nature. It is clear that epileptics and mental defectives are no more susceptible to primary suggestibility than normals. What suggestibility is found in these two groups must be due mostly to secondary suggestibility and prestige suggestibility, which two factors are, it is expected, much more closely related to each other than primary suggestibility is to prestige suggestibility; it may be that together they form a "social suggestibility" syndrome distinct from the ideo-motor type of suggestibility. It seems a possibility that these two experimental groups were relatively susceptible to this type of suggestibility. As long-institutionalized patients they aim at being "good" and earning approval; many of the remarks they made indicated this, and it is quite possible that the suggestion of the examiner in saying "Stand perfectly still" before playing the record had more weight with them than the suggestion of the voice on the record. Many patients openly dramatized the situation or treated it as a competition—"*He* couldn't make me fall!" This eager spirit of compliance would account also for their remarkably high perseverance scores; they must have been trying much harder than the neurotics and further, if it is taken that the "will-power" tested by this test is a function of the integrated personality and liable to be affected by neurotic disorder (but not by mental deficiency or an epileptic disorder), the difference between the perseverance scores of the neurotic group and the two experimental groups is in line with the conclusion drawn from the difference between their suggestibility scores.

Clinical impressions of the behaviour of 200 selected subjects in a standardized situation may be allowed some weight, although not the validity of a measurable score. The female epileptics gave the impression of being the most

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suggestible group; they largely tended to dramatize the situation, and were anxious to do well and pleased when they " survived " the test. The remarks they made about their medicine and treatment were often simple and childlike. Not all of the subjects in this group who admitted feeling affected by the suggestion actually swayed more than the normal amount. The following instances are taken from the female epileptic records :

" Makes me feel sick " (swayed 1½ in.).

" Makes me feel dizzy " (swayed 1½ in.).

" Makes me feel giddy " (swayed 4 in.).

" Makes me feel all hot " (fell outright).

A sway of up to 3 in. is taken as a normal score.

Two triumphant survivors : " I don't want to fall, lady; I like to be a good girl as long as I can " (swayed 1½ in.). " I'm very good at my nerves; I'm not frightened of insects or anything like that " (swayed ½ in.). No similar remarks were made by any other group.

Two cases (male mental defective and male epileptic) swayed right forward on the commencement of the record and had to be prevented from falling. They explained that they thought that the examiner wanted them to obey the record. On repeating the instructions and re-starting the record the mental defective swayed 6½ in. and the epileptic 4½ in., showing that they were highly susceptible to primary suggestibility, but not to such an extent as to be induced to fall outright. Here it seems that the command " Stand still " was acting against the suggestion " Fall forward " ; while under the impression that the examiner required it of them they were willing to fall right forward.

Eysenck (2), comparing the body sway scores of 160 men and 160 women, showed that the men were approximately twice as suggestible as the women. In this investigation only a slight significant difference was found between the scores of the men and the women. In Eysenck's paper an attempt is made to account for the difference in terms of the ideo-motor theory of action. Another likely cause of the difference was found in the clinical impression that on the average the women referred to the hospital where his investigation was carried on were less seriously neurotic than the men. This impression is confirmed by the results of this study, in which neurotic disorder is eliminated as a factor ; the result was a far smaller difference in the suggestibility scores of the male and female subjects; the difference, though slight, is still significant, and may be due to the greater predominance of ideo-motor imagery in male subjects.

The 13 " difficult " (psychopathic ?) boys in the mentally defective group (although the number is too small for any reliable conclusion to be drawn) all had a much lower score than average on the suggestibility test, indicating that their conduct disorder was not the result of neurosis ; this is evidence (slight and unreliable) for the view that the syndrome of psychopathic personality is distinct from and perhaps unrelated to neurosis. These boys were distinctly non-suggestible in the clinical sense; they were leaders rather than led among the troublesome patients, and had shown a fair degree of independence and initiative in their extra-mural criminal activities. One boy was recorded as having " lived by his wits "—no small achievement for a certifiable mental defective.

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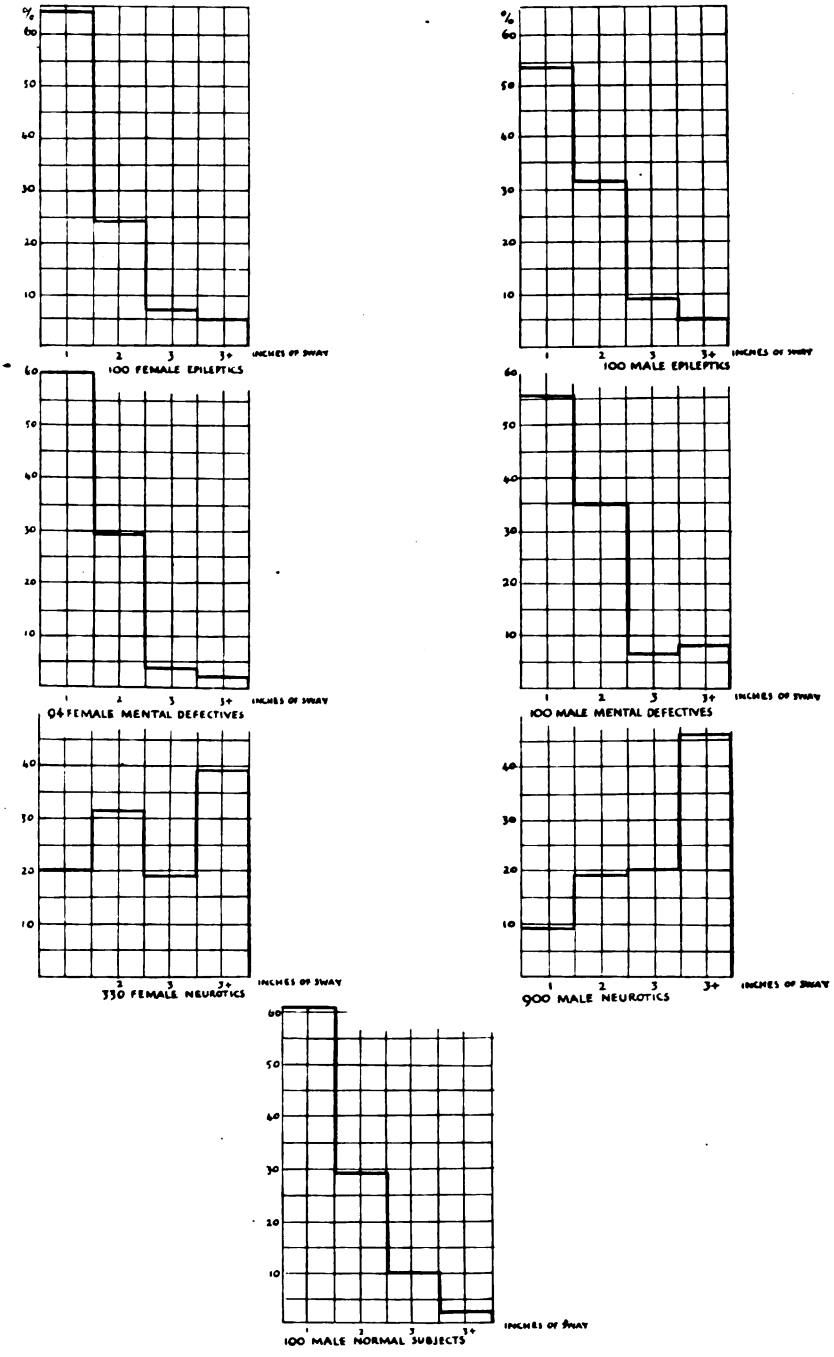

FIG. 1.—Body Sway in inches of normal, neurotic, epileptic and mental defective groups. Comparison of suggestibility scores of normal and various groups of abnormal subjects.

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On the whole the results of this study tend to confirm the ideo-motor theory of action in its explanation of the phenomenon of primary suggestibility—that primary suggestibility is the product of ideo-motor action restrained by inhibition. Neurotics are defective in this voluntary control, not, however, mental defectives and epileptics. A strong integration of impulses may yet be possible at a low level of efficiency, even in the face of such serious defects as a fairly severe degree of mental deficiency or a nervous disorder of an epileptic type. The "lack of will-power" demonstrated by the neurotics in contrast to the high perseverance scores of the epileptics and mental defectives gives confirmation to this view.

I am glad to have this opportunity of acknowledging the helpful interest and co-operation of the Medical Superintendents of the Manor Institute for Mental Defectives, Epsom, St. Faith's Epileptic Colony, Brentwood, and St. David's Epileptic Colony, Edmonton, whose patients acted as subjects in the investigation, and of thanking Dr. Eysenck, at whose suggestion this study was undertaken, for his constructive criticism.

(6) Summary.

1. Hull's Body Sway test of primary suggestibility and a simple motor test of persistence were administered to a group of 106 male, 94 female mental defectives, 13 male mental defectives classed as "difficult" (psychopathic ?), 100 male, and 100 female epileptics. Their scores were compared with those obtained by Eysenck for normal and neurotic subjects, and with those obtained by Petrie for hysterics and dysthymics.

2. The epileptics and mental defectives were not significantly more suggestible than the normal group; they were significantly less suggestible than the neurotic group. On the average they showed much higher persistence scores than the neurotics.

3. Male subjects were found to be significantly more suggestible than female subjects.

4. A small group of psychopaths was found to be significantly less suggestible than the neurotic group.

5. The value of Hull's Body Sway test as a screening test for neuroticism is further confirmed by this study.

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THE KENT AND OTHER TESTS USED ON THE SAME SUBJECTS.

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TESTS of the indefinable quality known as intelligence are legion. Many have been standardized satisfactorily, others have not. The validity of some tests is high, but results of different tests used on the same individuals have seldom been published.

The Kent Emergency Test, although standardized on average American children, is, to quote its author, "framed expressly for adult subjects." Consequently, it can be used on children or adults. In this investigation it has been used on both. The Stanford-Binet was standardized on children and has been used on them only. The F.H.3 (or R) for adults has been used on adults only, and the Progressive Matrices, standardized by Raven on children and adults, has also been used on adults only.

MATERIAL.

In these investigations the subjects, to a total of 1,566, were examined as follows:

(*a*) 557 subjects, each tested with the Kent and the Stanford-Binet tests.

(*b*) 409 subjects, each tested with the Kent and Part I of the Farmer-Hotoph 3 (or R) given as a group test.

(*c*) 600 subjects, each tested with the Kent and the Progressive Matrices given as a group test.

The Matrices tests were conducted by the Testers of the D.S.P. The F.H.3 (or R) tests were conducted by officers of the Army Education Corps. As regards the military cases, the Kent tests and many Matrices tests were performed by the writer.

Charts I and II show that the Kent, Binet and Matrices gave normal curves in populations (a) and (c).

RESULTS.

(a) *Kent Emergency and Stanford-Binet.* (Table VII.)

The Binet test and Earl's English modification of the Kent test (Rudolf) were given on the same day to each testee. Consequently, growth and temporary slight illness, e.g., headache, coryza, etc., would be unlikely to affect the results obtained on one test more than those obtained on the other. Both tests were given as individual tests, by the same tester, to all the testees. Both sexes were tested. The ages varied from $9\frac{5}{12}$ to 54 years, and the number examined was 557. All had been diagnosed as mental defectives before the tests were applied.

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CHART I.

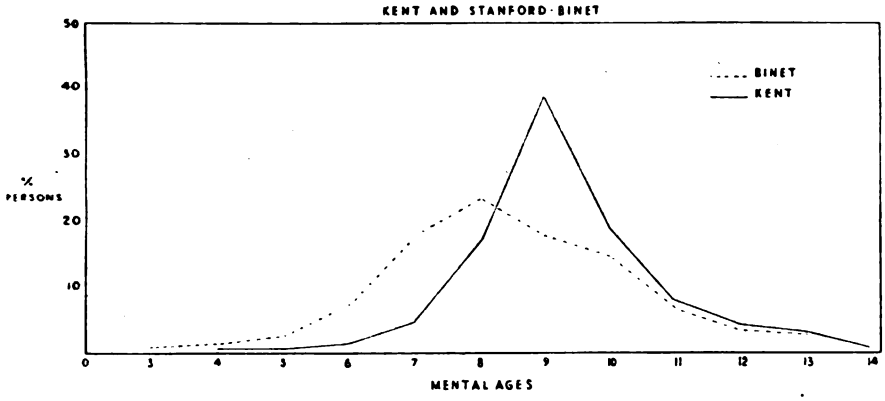
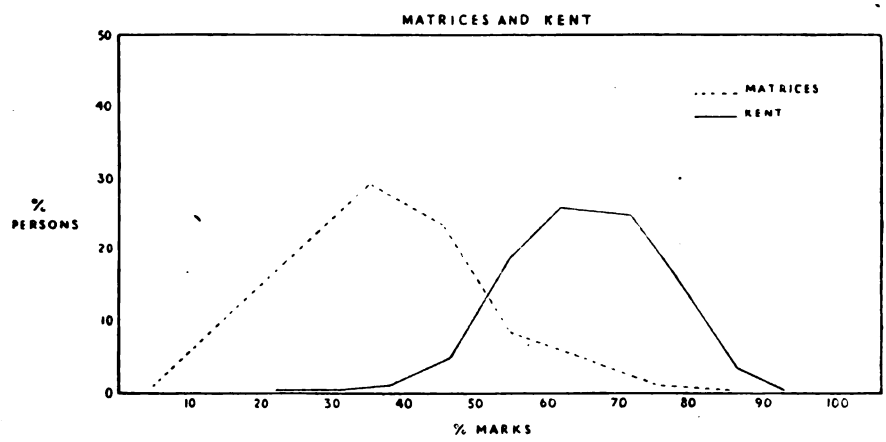


CHART II.



McIntyre and Hoffeditz compared the two tests on American feeble-minded individuals. The results of their investigations and of the present one on English subjects are shown in Table I.

TABLE I.—*Comparisons of Kent with Binet (Stanford).*

Number in series.	Chron. age (yrs.).	Mental age (Binet).	Mental age (Kent).	Mean Kent above mean Binet.	Kent > Binet %.	Kent = Binet %.	Kent < Binet %.	Author
(1) 161	5–30+	3–14	5–14	·81	74	6	20	McIntyre and Hoffeditz
(2) 557	$9\frac{5}{12}$–54	3–16	5–14	·63	61·1	24·7	14·1	Present

This table shows that, in both investigations, the Kent records higher than the Stanford Revision in 60–75 per cent. of cases, but that in any individual it is impossible to foretell whether he will score higher or lower, as up to 1 in 5 may score lower on the Kent than on the Binet. The distribution of the cases is seen in Table VII.

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(b) *Kent with F.H.3 (or R) Part I.* (Table VIII.)

The F.H.3 (or R) was given in groups, the Kent individually. Each subject was given the two tests, all the Kent tests being given by one tester. The subjects were adults of the male sex, a total of 409 being examined. The men were serving soldiers. The percentages obtained in Part I of the F.H.3 (or R) were compared with the percentages scored in the Kent Test. In the latter the percentages were calculated for the lower and middle scales on the maximum obtainable on the middle scale. Thus, the lower scale was regarded as a part of the middle scale. This is fair, since those of the lower intelligence are tested on the lower scale because they cannot reach the upper parts of the middle scale, and the marks for similar mental ages on the lower and middle scales are almost identical. With the upper scale the percentages were calculated on the maximum marks obtainable on this scale. The marks obtainable on this scale and on the middle scale are very dissimilar for identical mental ages. Table II shows the results obtained. Differences are considerable.

TABLE II.—*Marks Obtained by Same Testees on Kent and F.H.3 (or R).*

Subjects obtaining the marks.	Marks (per cent.) obtained—	
	On Kent.	On F.H.3 (or R).
169	58–74	3–11

All, with the exception of one man, scored less than 35 per cent. on F.H.3 (or R) test, but only three men scored less than 34 per cent. on Kent's Scale.

(c) *Kent with Progressive Matrices.* (Table IX.)

The same subjects were tested with both tests. The Kent was given by one tester to all subjects, who were male adults only. The Matrices was given as a group test, and by numerous testers. A total of 600 men was tested. All were serving soldiers. The percentage marks obtained in the two tests were compared, the method of calculating those in Kent's test being as in the Kent-F.H.3 (R) (Table II).

The differences are less than is the case with the F.H.3 (or R) test as shown in Table III :

TABLE III.—*Marks Obtained by Same Testees on Kent and Matrices.*

Subjects obtaining the marks.	Marks (per cent.) obtained—	
	On Kent.	On Matrices.
229	66–81	11–61

DISCUSSION.

The results of these examinations show that individuals tend to score higher on Kent's test than on the Stanford-Binet, on Kent's than on F.H.3 (or R), and on Kent's than on the Progressive Matrices. As the same testees score differently on the tests, the tests may be testing different properties,

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may be standardized incorrectly, or the allotting of marks may be on different principles. It is clear, however, that the Kent test gives higher results than the others, whatever the reason may be. (Table VII)

The giving of a test as a group or an individual test is of importance. This is especially so in the case of the Progressive Matrices, in which the marks for the individual test worked out on 660 children are lower than those for the group test, worked out on 1,407 children (Raven). The differences of the median scores of the group test and of the individual tests are shown in the following table, in each case the median for the group test being higher than that for the individual :

TABLE IV.—*Differences of Matrix Median (Group and Individual).*

C.A.	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½
Diff.	2	5	6	10	6	9	8	8	5	6	6	6

The difference between the 95 percentile points and the 5 percentile points respectively are shown in Table V in marks obtained in this test. Again, in each case, the differences are positive in favour of the group test, except at year 13 in the 95 percentiles, and at years 9½ and 10 in the 5 percentiles.

TABLE V.—*Differences of the Group and Individual Matrices.*

C.A.	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½
95 percentile	12	4	4	6	7	7	2	3	2	0	—1	0
5 percentile	0	1	0	—1	—1	0	1	2	1	3	1	3

In the lowest 5 per cent. of individuals from 8 to 11 years C.A., it is apparently immaterial whether the test is given as a group test, or individually. The same situation is true for the highest 5 per cent., with ages of from 12½ to 13½ years. The remaining differences fall between these two extremes of the lowest 5 per cent. of individuals at the lowest chronological ages and the highest 5 per cent. at the highest chronological ages.

If the mental ages are to be utilized for comparison with other tests, it is therefore necessary to know whether the test was given as a group, or as an individual test. Whatever the results given by a test, it is clear that the children themselves possess the same quantity of intelligence at the various C.A., although the same test, used differently, gives varying results. It follows that either the individual method, the group method, or even both methods, are inaccurate for recording intelligence alone.

The scores obtained on the Matrices Group Test have been placed by Raven in Grades (see Table VI), for adults.

For the purposes of comparison the use of the gradings (see Table VI) is unsatisfactory. A subject at the lower limit of one grade will be grouped in a grade different to that of a subject at the upper limit of the next lower grade, although separated by only one mark. A subject at the top of one grade may be as

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TABLE VI.—*Matrices Grades (Raven).*

Grade I	55 and over
Grade II	49–54
Grade III plus . . .	44–48
Grade III minus . . .	29–43
Grade IV	24–28
Grade V	Up to 23

much as 23 marks from a subject at the bottom of the same grade, although both are grouped together. If the grade in which a subject falls is used, comparisons will therefore be unreliable.

As the mental ages read from the median differ according to whether the Matrices test is given as a group or as an individual test, there being up to 1½ years' M.A. difference with the same median score, and as the same score can be recorded, in the individual test, on any mental age extending over a period of 1½ years, e.g, 16 marks can give from 7 to 8½ years' M.A., it is clear that the use of the mental ages for comparison is not reliable.

In consequence the marks obtained have been used. As pointed out by Raven, the standard series does not differentiate clearly between individuals within the groups.

The tests under consideration are so constructed that the so-called normal or average individual is unable to obtain full marks. The maximum mark obtainable in each test is not, however, the same. In the Kent test it is 42, 49 and 54 for the three scales, in the F.H.3 (R) test (Part I) it is 62, and in Raven's Matrices Test it is 60. In the comparison of the Kent Tests with the F.H.3 (R) or Raven's, it will therefore be necessary to determine how far the testee has been able to progress in each test. A simple plan is to calculate

TABLE VII.—*Kent and Stanford-Binet.*

Kent M.A.	Binet M. A. 3—	4—	5—	6—	7—	8—	9—	10—	11—	12—	13—	14	Kent totals.
4—.	1												1
5—.		1		1									2
6—.		2	3	0	2	1							8
7—.		2	3	13	9	2							29
8—.			6	21	35	26	9	1					98
9—.				6	52	81	49	25	7	1	1		222
10—.				1	2	20	35	34	7	6	2		107
11—.					1	2	7	17	11	6	2		46
12—.						1	1	4	9	5	5		25
13—.							1	4	4	3	4		16
14 .									2		1		3
Binet totals .	1	5	12	42	101	133	102	85	40	21	15	0	557

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the percentage of the total marks he has obtained and compare these percentages. This plan has therefore been followed. (Tables VIII, IX.)

TABLE VIII.—*Kent with F.H.3 (R).*

Kent percentage marks.	F.H.3 (R) Percentage marks. 1—	5—	9—	13	17—	21—	25—	29—	33—	35	Kent totals.
26—	1	1			1						3
34—	0	2	2		0						4
42—	9	8	6	1	0	2					26
50—	22	26	21	2	3	0	1				75
58—	36	44	34	4	3	5	1	2	1		130
66—	22	32	31	3	3	4	5	1	1		102
74—	9	12	20	5	2	4	1	2	4	1	60
82—	3		2	1		1		1	1		9
90											
F.H.3 (R) totals	102	125	116	16	12	16	8	6	7	1	409

TABLE IX.—*Kent with Group Matrices (all Cases).*

Kent percentage marks.	Matrices percentage marks. 1—	11—	21—	31—	41—	51—	—61	71—	81	Kent totals.
18—		2								2
26—		0	1	2						3
34—		3	2	1	1	1				8
42—	1	8	9	10	5	1				34
50—	1	11	29	37	26	8		1	1	114
58—	1	20	34	50	39	10	4	1	1	160
66—	3	14	26	47	40	13	9	1	1	154
74—		7	13	22	32	15	7	5		101
82—			4	5	4	2	7	1		23
90				1						1
Matrices totals	6	65	118	175	147	50	27	9	3	600

Correlation coefficients have been kindly worked out by Prof. M. Greenwood from the tables. These are as below :

		Number of obs.		
Table VII	Kent and Stanford-Binet	557	+0·7499	±0·019
„ VIII	Kent with F.H.3 (R) (group)	409	+0·0893	±0·049
„ IX	Kent with Group Matrix (all cases)	600	+0·2686	±0·038

The Kent and the Stanford-Binet tests show a fairly high correlation; the others, low.

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Conclusions.

The Kent Emergency Test cannot be used as an alternative to the Stanford-Binet, the Progressive Matrices, or the F.H.3 (or R) test, as it does not record similar results on the same individuals.

In conclusion, especial thanks are due to Prof. M. Greenwood, F.R.S., for his advice and the calculations of the correlation co-efficients.

Thanks are due to Dr. J. Lyons, Medical Superintendent of Hortham Colony, Bristol, for permission to quote the cases from that colony.

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THE MANAGEMENT OF CHRONIC MENTAL PATIENTS.

By A. P. TAIT, M.B., Ch.B.

From the Department of Clinical Research, Crichton Royal, Dumfries.

[Received 27 December, 1947.]

MANY difficulties confront the medical officer who has in his care large numbers of mental patients. In the first place, owing to the staffing problems which beset the majority of mental hospitals in this country, he is probably overworked. He has neither the time nor the energy to deal adequately with the mass of work which confronts him, and as a result his output is often not as efficient as it could be. Further, when dealing with large numbers, a physiological factor enters which is often overlooked. It is very difficult to register and retain the many small variations in behaviour which are so important in the understanding of a patient, when perhaps 350 or more patients have to be seen every day. There seems to be a definite saturation point beyond which images are not retained; indeed we know that this is so, but we rarely seem to take account of it. The very sameness of deteriorated and apathetic patients contributes to this state of affairs.

From such considerations it will be obvious that in order to do his work efficiently as he can, the medical officer must not waste time. He must organize his work so that the time he spends with his patients is productive, for it is fatally easy to walk round a ward once or twice a day and achieve little, particularly with a good nursing staff in charge.

An analysis of this type of non-productive ward round led the writer to formulate an " aid " in an endeavour to overcome some of the difficulties and make his work more interesting and efficient. It was felt that it might be an advantage to have a record of behaviour covering the entire population of the ward, and which would give the reader an impression of how the ward had fared during the previous day. At the outset it was impossible to foresee practicability of such a procedure, but it was obvious that the attempt would be instructive, and at the worst, would provide an interesting experiment.

The " aid " would have to be simple, because it would be administered by an already hard-working nursing staff. It was adopted from Moore (1942), who used a series of numerical symbols to indicate levels of behaviour.

DESCRIPTION OF METHOD.

It was decided to record the amount of nursing required by each patient during the day. The grading adopted was as follows:

" o " = A clear day. One on which the patient required no nursing care of any kind.

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"1" = Routine nursing care. Patient had to be led to the bathroom or put in his place for meals, or supervised while dressing or undressing.

"2." = Routine nursing care plus special attention, not to the extent of—

"3" = More or less constant vigilance during the day.

"4" = Constant vigilance plus restriction from violence.

The numerical score was than completed by a symbol indicating within very broad limits the type of behaviour giving rise to it; thus "*" indicated noisy, impulsive and/or hallucinated behaviour; "+" destructiveness and "○" incontinence.

Finally, an indication of the treatment given was shown by a □ enclosing the score, which signified that an E.C.T. had been given; a line beneath the score that a sedative had been given; an ○ enclosing the score indicated that the patient had had an epileptic fit.

Fig. 1 is a specimen of the record covering the period of four weeks. It will be seen that in the left-hand column the names of those patients appear who have scored *more* than 1 on some occasion during the four weeks. Those who constantly score 1 are shown as "Daily total of 1's" at the foot of the page. If any of these patients scored more than 1 on any day the name was then added to the list and he scored individually. If any patient scored a daily 1 for a period of four weeks his name was dropped from the list and he then figured in the bulk total.

In the ward in question there were no parole patients, and no patients sufficiently well to score 0.

The actual recording was done by the senior nurse on duty when he wrote up the ward books in the evening, and in order to assist him a small card was made out, giving the meaning of the various symbols, etc.; though this rapidly became superfluous, it was useful for demonstration purposes.

In order to give an impression of the conditions under which the record was used, a brief description of the group and its surroundings will be given.

Owing to war-time evacuation from other hospitals, the ward in which the "aid" was tried out had at that time a fairly static population of 73 patients. The latter are accommodated during the day in a large, centrally heated day room which leads out into a covered verandah. This in turn leads to the ward garden. The verandah is shared with the other half of the house. Sleeping accommodation comprises one large dormitory on the first floor, divided into two unequal parts by a partition. Both upstairs and down there are a series of observation rooms for use in an emergency. There are no padded rooms. One of these rooms is adapted for giving E.C.T.

The patients comprise:

Schizophrenics	27
Mental defectives	23
Epileptics	8
G.P.I.'s	4
Senile dementia	10
Others	1

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Names		Jan 15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Feb 1	2	3	4	5	6	7	8	9	10	11
Barry. G.M.	Epilepsy	2	3	[2]	2	2	2	1	2	2	[2]	2	2	2	2	2	2	2	2	[2]	1	1	1	2	2	2	2	2	2
Gardner. W.	do	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	(1)	2	1	1	1	1	1	1	1	1	1	1
Poland. J.	do	2	2	2	2	2	2	2	(2)	(1)	2	(2)	2	(2)	(2)	(2)	2	2	2	(1)	2	1	(3)	1	(1)	1	1	1	1
Duncan. Jos.	Mental Def.	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1
Johnston. Wm.	do	2	2	3	3	[2]	1	2	1	1	[1]	1	1	1	1	1	1	[1]	1	1	2	1	1	2	[2]	1	1	1	1
Espie. J	do	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	2	(2)	1	1	1	1	1	1
Telfer. Wm.	do	3	3	3	[3]	3	2	3	2	2	[2]	2	2	[2]	2	2	2	[1]	1	2	[2]	1	2	[2]	1	[1]	2	2	[2]
Ross. R.J.	do	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Lockerbie. Wtr.	do	2	2	2	2	2	2	2	2	[2]	1	1	1	1	1	1	[1]	1	1	1	1	1	1	1	1	1	1	1	1
Carmichael. R.	do	4	3	3	2	2	3	[3]	2	1	1	1	2	2	[2]	2	2	2	3	2	2	[2]	1	2	[2]	2	2	2	[2]
Lightfoot. A.	Schizophrenia	1	2	2	1	1	2	2	2	2	2	2	3	2	3	[2]	1	1	1	1	[1]	1	1	1	1	1	1	[1]	1
McHallam. J.	do	2	2	2	3	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	1	1	1
Dalgleish. R.	do	2	2	1	1	2	1	2	1	1	2	1	1	2	[2]	2	2	2	2	2	2	[2]	2	2	2	2	2	2	2
Bruno. M.A.	G.P.I.	2	2	2	2	2	2	2	2	2	2	3	2	3	3	3	[2]	2	2	2	2	2	2	2	2	1	1	2	2
Palmer. A.	do	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	1	1	1	2	1	1	1	1	2	2	2
Bennett. J.	do	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
McCrone. M.	Senile Dem.	2	2	2	2	2	2	2	1	2	2	1	1	1	2	1	1	1	1	1	2	1	1	1	2	1	1	1	1
Hoggan. W.	do	1	1	1	2	2	2	2	2	2	1	2	2	2	3	2	2	2	2	2	2	2	2	2	1	1	2	1	1
Grant. P.	Paraphrenia.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	[1]	1	1	1	2	2	1	[1]
Daily Total.		36	38	38	38	37	35	37	32	31	31	31	32	32	35	31	30	29	30	28	30	30	29	28	26	27	28	27	27
Weekly Total.								259							224							208							192
E.T.C. Daily Total.				1	1	1		1		1	3			1	2	1	2	2		1	2	3		1	2	1		1	3
E.T.C. Weekly Total.								4							7							11							8
Number of 1's.		54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54

○ = Dirty
+ = Destructive
* = Hallucinated and/or Impulsive.
◯ = Epileptic Fit.
□ = E.C.T.
= On Sedative.

FIG. 1.

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Of these, 14 worked out of doors in a gardening squad; 12 are employed as ward workers; 18 are capable of doing occupational therapy; 29 are not capable of doing anything.

Approximately one-third of the total required more than routine nursing care.

All the defectives had signs of psychosis apart from their mental defect.

Results.

After a period of seven months during which the record has been in operation, it is possible to make some general observations on the role it had played in the management of the ward.

(1) It became the habit to consult the record at the outset of the morning visit, which was then planned so that time could be spent on those patients who had required most attention.

One advantage of this planning was that the patients could be mustered in advance, and time was not wasted while nurses went in search of them. Usually the top scorers were already mustered before the doctor reached the ward. It is not denied that a similar procedure can operate well without the presence of any kind of record, but contrasting the ward under discussion with, for instance, the ward which occupied the other half of the house, there was a purposefulness about the morning round which was not attained in the "control" ward.

(2) From a therapeutic point of view the "aid" came to be used in the following ways:

(*a*) As an adjunct to clinical observation in determining the optimum time for E.C.T. in any given case, especially in those patients who were given "maintenance" treatment.

(*b*) As a means of estimating the response to treatment of any kind, and particularly the duration and type of response.

(3) It had the effect of transforming what tended to be "treatment in the mass" into treatment of the individual, an effort which was noticed in particular by the nursing staff.

(4) One result, not anticipated, was an apparent improvement in the general level of behaviour of the ward.

Realizing the difficulty of being objective in making an observation of this kind, the opportunity was taken of subjecting the results to statistical treatment, and it may be of interest to summarize the method used and the results obtained.

The numerical scores were restated in terms of "refractory units" (R.U.) one of these being defined as equivalent to "the attention of one nurse for one hour."

The values adopted were "1" = 1 R.U.; "2" = 4 R.U.; "3" = 9 R.U. No "4's" figured in the period under discussion.

The results are depicted in Fig. 2. It will be seen that the total refractoriness has fallen from 396 R.U.'s in November, 1946, to 289 R.U.'s in April, 1947, a difference which is significant.

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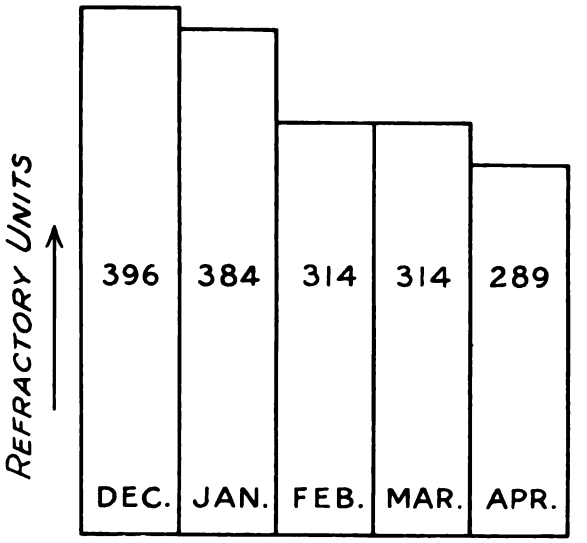

FIG. 2.

Thus the figures, providing that the mathematical assumptions are not very inaccurate, bear out the clinical observations.

DISCUSSION.

One of the criticisms which may be made about the chart is that the symbolism is too complex. In defence it can only be said that practice has shown this not to be the case. A more pertinent criticism would be that the symbolism was not complex enough; that to try to record behaviour in terms of five numbers and three signs is futile. It must be remembered, however, that the chart does not in fact record behaviour; it is basically a quantitative record concerned with nurses' time in relation to each patient, with some effort to show the qualitative nature of the behaviour absorbing the time. The real relationship to the behaviour of the patient lies in the fact that the more disturbed the patient, the more nursing he needs, and secondly, that the more nursing a patient needs the more likely he is to require treatment.

No attempt will be made to explore all the possible applications of "aid." Some have been touched upon, but the writer has made no attempt at systematic study of any particular group of patients and is therefore unable to assess the value or otherwise of the "aid" in such a study.

The purpose of the paper has been rather to place on record the work that has been done in the hope that some may find it of interest.

In conclusion it should be stated that during the period under review the additional work thrown on to the nursing staff was borne without protest—indeed the scheme aroused a good deal of interest and keenness.

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Summary.

A psychiatric "aid" in the form of a running record of the amount of nurses' time absorbed by each patient in a group of 73 is presented, and some of the results and applications discussed.

I am indebted to Dr. P. K. McCowan, Physician Superintendent of the Crichton Royal, for his permission to publish this paper, and to Dr. W. W. Roberts for his help in the statistical treatment of the results. My special thanks are due to Male Nurse B. A. MacFarlane for his keen and untiring co-operation.

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Part II.—Reviews.

Group Psychotherapy. By J. W. KLAPMAN, M.D. London: William Heinemann, Ltd., 1946. Pp. viii + 344. Price 21s.

The body of this book is concerned with the practice of group psychotherapy in the mental hospital. It is made clear that the mental hospital should be transformed into a complex pedagogic establishment. Four forms should be created, with recent cases in the highest and deteriorated patients in the lowest form. Again, each form would be sub-divided into a number of classes. The curriculum is only given for Form A, and "downward revision" is suggested for other forms. The syllabus for Form A includes a course of 24 lectures in psychology and allied subjects; the reading of text-books; the reading of and debating on anonymous histories of members of the class. Records of class attendance should be kept; there should be progress reports at stated intervals and honours, and small prizes should be awarded.

As adjuncts, Moreno's method of psychodrama should be employed. Other ancillaries are the formation of social clubs; a hospital loud-speaker system, by means of which the superintendent can practise talitarian group therapy; the creation of an institutional journal and a relationship committee to educate the general public.

In the out-patient clinic and in practice Schilder's biographical technique is thought most suitable. For problem children Glasson's modification of recreational therapy is preferred. The book starts with a historical survey, followed by an exposition of Freud's theory of group psychology.

STANLEY M. COLEMAN.

Deep Analysis: The Clinical Study of an Individual Case. By CHARLES BERG, M.D., D.P.M. London: George Allen & Unwin, Ltd., 1946. Pp. 262. Price 12s. 6d.

This book provides a detailed report of the analysis of an intelligent young man who came for analysis on account of emotional blunting and lack of drive, conflict over masturbation and lack of hetero-sexual interest. The analysis follows along orthodox lines. In the transference situation first a strong father-fixation is acted out; later, and at a deeper level, mother-fixation is unmasked. During the course of the analysis pre-genital mechanisms come to the surface. Of these the anal-erotic component is worth a brief notice.

A phase of negative transference had coincided with failure to meet the analyst's bills. It is then learnt that the analysis had absorbed not only the money put aside for this purpose, but also the current monthly saving as well. Later it emerges that the analysand has an inherited capital of £20,000, which he is loath to "cast into the melting pot." Analysis shows that in the unconscious this capital is identified with ego-rigidity, the interpretation being that "the proportion of his capital which he was prepared to put into the analysis was an index of the proportion of his personality that he was prepared to change. Hitherto the proportion had been zero." On this the patient asks: "Well, if I spent a thousand pounds of my capital what good would that do?" To which there is the laconic reply: "At a proportionate estimate I should say one-twentieth of the whole!" Though it is learnt that the analysis was carried to a successful conclusion, it is disappointing that we are not told what proportion of the ego-rigidity was ultimately made "fluid."

STANLEY M. COLEMAN.

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War, Sadism and Pacifism. By EDWARD GLOVER, M.D. London: George Allen & Unwin, Ltd., 1947. Pp. 292. Price 9*s.* 6*d.*

This volume is an extended series of essays, the original having been published in 1933. There is little internal evidence to suggest that during the last 14 years experience has caused the author to modify any of his basic principles. Briefly it can be said that the author's analytical experience has shown him that a man's attitude both to war and peace is based upon unreal fear and anxiety. These are the result of repressions and distortions, a legacy from the nursery. Applying these findings in individuals to international problems, it is believed that unconsciously motivated sadism and masochism are the essential causes of war and that economic factors, for instance, are partly or largely a "screen" for the real psychological causes. To prevent war it is advised that a large-scale research programme should be undertaken. This should be sponsored and financed by the State or UNO. Its purpose would be to search out and uncover the "irrational" causes of war and to point the best way to eliminate them for the future.

Supposing that all Dr. Glover has to tell us about individual reactions to war and peace is conceded, it has yet to be shown that this has any relation to, or even bearing upon, the causes of war. Save for organized human society, all the evidence points to the fact that throughout the animal kingdom when and wherever the economic cake is too small to go round, the result is behaviour of the "total war" pattern. Dr. Glover would have us believe that a sovereign state armed to the teeth and economically unsatisfied is not an object of rational apprehension to a neighbouring state. He tells us that there is no real enemy beyond the frontiers. It is merely that by projection we have externalized our own unconscious hate. It is advised that money now spent on the re-organization of state defence should be handed over to the psychoanalyst, who would then reorganize the nursery, the real source of the trouble.

The reviewer likes to imagine Dr. Glover explaining to the Stegosaurus facing a flesh-eating Tyrannosaurus, that such heavy armament is an uneconomical outlay, since his fears are due to irrational causes and that what is really needed is a thorough overhaul of the nursery life of the Dinosaurs. As Emery Reves has made abundantly clear, where human law is absent jungle law prevails. Between sovereign states there is no human law.

It is to be presumed that Dr. Glover has got so used to standing on his psychological head in his attempts to find irrational causes for his patients' disorders that finally this acrobatic feat has become his normal posture. From such an angle a starving man who stole a loaf of bread could be regarded as a case of kleptomania.

STANLEY M. COLEMAN.

Ego, Hunger and Aggression: A Revision of Freud's Theory and Method. By F. S. PERLS, M.D. London: George Allen & Unwin, Ltd., 1947. Pp. 274. Price 12*s.* 6*d.*

This interesting book is in part a criticism of psycho-analysis, and in part an attempt to put forward a new theory of psychological disorder and a new approach in psychotherapeutic technique.

The author agrees with Freud that in psychogenic diseases the symptom has a meaning, that there is a disturbance of development and adjustment, that the instincts, emotions and the unconscious play a much more important part than reason, and that these disorders are the outcome of a conflict between organism and environment. On the other hand, he thinks that Freud overestimated the importance of causality, the past and sex instincts, and neglected the importance of purposiveness, the present and the hunger instinct. From the point of view of technique he believes there is too much analysis, free-association and "dis-centration" away from the symptoms. He further criticizes the nearly obsessional religious ritual of the analytical session.

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The author is indebted to a number of sources for his critical attitude. First there is Friedlander's dialectical philosophy of "creative indifference." Psycho-analytical concepts are constantly reviewed from this angle. For instance, he finds that love and hatred are proper opposites, but sex and death instincts are incorrect poles. The influence of Bergson is shown by the importance attached to the present situation and final causes, as against the analysts' concentration on the past. The influence of Gestalt psychology and Smuts' "holistic" conception are also conspicuous. In the author's opinion Freud tends to treat psychological facts as if isolated from the organism.

Dr. Perls' main criticism is directed against the conception of an aggressive instinct. It is his belief that there is no such energy as aggression, which is a biological function, and "in our time has turned into an instrument of collective insanity." From here there is an examination of the hunger instinct, which is found to be quite separate from the sex instinct. He finds that the destructive tendency is a very powerful instrument of the hunger instinct, which should have its natural outlet in the use of the teeth. If this tendency remains ungratified, it may evince itself in such harmful ways as killing, waging war, cruelty, or by means of "retroflection," as self-torture or even self-destruction. It is held that the use of the teeth is the foremost biological representation of aggression. Projection, repression of (or the resistance to) aggressive functions may result in such character anomalies as the melancholic and the paranoid, and are also largely responsible for the "deplorable state of our civilization."

The last section of the book is devoted to a series of exercises in concentration therapy. From the above it is not surprising to find that the first exercise is devoted to chewing.

The reader will find much that is stimulating and thought-provoking in this book. He will also find much that he is quite unable to accept. For instance it is surprising to learn that Freud "neglected the importance of purposiveness." Despite his exercises in chewing it is to be noted that Dr. Perls still has a healthy reserve of aggression. This comes prominently into play when he is dealing with those of a different political complexion.

S. M. COLEMAN.

Psychopathology: A Survey of Modern Approaches. By J. ERNEST NICOLE, *O.B.E.*, L.M.S.S.A., D.P.M. Fourth edition. London: Baillière, Tindall & Cox, 1946. Pp. viii + 268. Price 15*s*.

A further edition of this standard work on psychopathology requires only a brief notice here. It is a popular favourite, and provides a lucid introduction to all the main schools of thought upon the subject. In this edition there have been only minor alterations and additions. S. M. COLEMAN.

The Psycho-analytical Approach to Juvenile Delinquency. By KATE FRIEDLANDER, M.D., D.P.M. London: Kegan Paul, Trench, Trübner & Co., Ltd., 1947. Pp. viii + 296. Price 18*s*.

The book is divided into three sections, preceded by a few introductory chapters on the psychiatric, psycho-analytical and sociological approaches to juvenile delinquency. The first section is theoretical, and is concerned with the development of the child towards social adaptation. It is a clear and adequate representation of orthodox Freudian theory. The second section provides clinical descriptions of the various types of delinquent. There are a number of case-studies, a few being reported in great detail.

In the section on treatment stress is laid on the importance of an early and thorough diagnostic examination by psychiatrist, psychologist and social worker. Psychological methods of treatment include psycho-analysis and

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other forms of psychotherapy. Environmental methods should be combined with psychological treatment. In many cases much can be done by re-education of the parents. In those cases where delinquent behaviour is due to an antisocial character formation and where the home background is beyond repair a foster home is the first choice. If this is impossible, institutional treatment will be necessary. The author thinks that small establishments have many advantages over the big institutions. For the prevention of crime the economic conditions of the homes should be improved, parents should be better educated on the bringing up of children and maladjusted parents should be treated.

Psychoanalysis is founded on the pleasure-pain principle, and it is therefore surprising to find that punishment, the orthodox method of training towards social adaptation, is hardly referred to. Surely a critical and statistical appreciation should be a central feature. Here a few isolated incidents are cited where punishment has been unsuitable or discipline too severe. Again all we are told as to the value of punishment is that a subjective motive, namely unconscious guilt, which finds relief in the punishment of the criminal, is to be imputed to the public. S. M. COLEMAN.

The Psychology of the Unwanted Child. By AGATHA H. BOWLEY, Ph.D. Edinburgh: E. & S. Livingstone, Ltd., 1947. Pp. xii + 112. Price 6*s*.

This well-written and informative little book should be of real value to matrons, wardens, and all those people who are responsible for the care of children removed from their homes. Such children include the homeless, the unwanted, the rejected and the uprooted child. It is stressed that healthy roots are essential for healthy personality development. Where the roots are not healthy it may be possible to improve or readjust the home and school conditions. If this cannot be done advice is given on the adjustment both of child and environment in a substitute home or institution. A main purpose is to hasten the fulfilment of many of the recommendations of the Curtis Committee Report. S. M. COLEMAN.

Men Under Stress. By R. R. GRINKER and J. P. SPIEGEL. London: J. & A. Churchill, Ltd., 1945. Pp. xii + 484. Price 25*s*.

This most excellent book is devoted to a consideration of the psychological problems of United States Air Force personnel, i. e. flying personnel. The work is divided into two sections, the first dealing with war neuroses appearing overseas, and the other with men returned home for relief from flying or rehabilitation. A small section is added on the application to civilian psychiatry and on general social implications.

There are 65 illustrative case-histories, the cases being described in considerable detail and the treatment of each case given.

Although the book as a whole is very well done, there is a great deal of unnecessary matter. There are about 180,000 words in the book—this could be very greatly reduced without in any way detracting from its great merit.

G. W. T. H. FLEMING.

Mental Health. By J. H. EWEN, F.R.C.P.E. London: Edward Arnold & Co., 1947. Pp. 270. Price 12*s*. 6*d*.

This small book the author states "represents an attempt to give a concise account of the salient features of mental illness as a whole and to depict this branch of medicine in as simple and practical a manner as possible."

The author has succeeded very well indeed in what he set out to do, and we know of no better "concise account" of mental illness.

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"Particular attention has been given to the requirements of students who may be studying for a Diploma in Psychological Medicine." Having regard to present-day requirements for the D.P.M., we doubt if there is enough in this small book to "satisfy the examiners"; the standard of the D.P.M. is very much higher to-day than it was ten years ago.

It is an enjoyable book to read and we think most useful for students and practitioners. The book is well produced, and in every way a credit to British Psychiatry. G. W. T. H. FLEMING.

A Handbook of Psychiatry. By L. J. KARNOSH, M.D., and E. M. ZUCKER, M.D. London: Henry Kimpton, 1945. Pp. 302, with 40 illustrations. Price 25s.

This small book is offered to the general practitioner. It presents psychiatry from the standpoint of the American school, looking on mental illness as a reaction to various psychologic and biologic forces.

Is it necessary in the glossary to tell general practitioners that psychiatry is the "study and treatment of mental disease," or that coma is "a profound stupor from which the patient is aroused with great difficulty?"

We think it unwise to stipulate that "as a rule psychoneurotic individuals do not develop a psychosis, and the common lay notion that nervousness is usually a forerunner of mental disease is not based on clinical experience." Neurotics often do develop psychoses. What *does* the author mean by nervousness? He does not define it in his glossary! Surely in these modern days both terms neurasthenia and psychasthenia have been discarded. Reactive depression, a condition of depressed mood, where the situation is so distressing that it is naturally productive of dejection, sounds to us like a perfectly plain psychosis and *not* a neurosis. G. W. T. H. FLEMING.

Agnosia, Apraxia, Aphasia. Their Value in Cerebral Localization. By J. M. NIELSEN, M.D. Second edition. New York: Paul B. Hoeber, 1946. Pp. 304, with 59 illustrations. Price £1.

The second edition of this book, which first appeared in 1936, is a great advance, but it is only for those who have an extensive knowledge of neurology and of neuroanatomy. To these rather eclectic readers the book will be a sheer joy, for it is very well written and extremely well produced and illustrated, and not, as is so distressingly common nowadays, "in keeping with regulations for conserving paper and other essential materials."

The author gives a brief account of the historical development of his subject, and then outlines his concept of eugnosia, eupraxia and euphasia, the disturbance of which yields agnosia, apraxia and aphasia. The agnosias he divides into visual and acoustic varieties, the apraxias into kinetic, ideokinetic and ideational types, and the aphasias into those of higher and lower levels. The former contains the semantic aphasia of Head, while the latter contains motor and sensory aphasia.

He gives a brief but most useful chapter on methods of examination, short enough to be used as a routine in clinical examination. In an appendix he gives a very good summary and a glossary of terms.

To anyone who is prepared to work steadily through the book and familiarize himself with the terminology there is a great deal to be gained.

G. W. T. H. FLEMING.

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* A number of abstracts in this section are reproduced from *Chemical Abstracts* and *Psychological Abstracts*. To the Editors of these Journals we extend our grateful thanks.

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Clinical and EEG Investigation of Prefrontal Lobotomy Patients.

1. A follow-up study of 30 cases of prefrontal lobotomy was done. Twenty-three of these patients were operated on after admission to St. Elizabeth's Hospital after a prolonged incapacitating illness. Of these 23, 21 were benefited by the operation, 11 were considered social recoveries, and 9 were discharged from the hospital. An organic syndrome was substituted for the psychosis. Restitution of the patient's pre-psychotic state should not be expected. One patient was made worse.

2. Protracted illness did not militate against improvement in these selected cases.

3. The criteria employed for the selection of these cases for psycho-surgery are justified by the high percentage of patients that were benefited.

4. No objective neurological signs resulted from the operation.

5. Post-operative convulsions occurred in 10 out of 30 cases.

6. Electroencephalograms of 23 out of 24 cases showed definite abnormalities.

7. There is no correlation between EEG pattern and post-lobotomy improvement. (Authors' abstr.)

The Effect of Bilateral Frontal Lobotomy upon the Autonomic Nervous System.

1. Cortical representations of the autonomic nervous system are located in the prefrontal area.

2. Following the subcortical section of the frontal lobes, the autonomic nervous system becomes more responsive to stimuli from without.

3. Equilibrium re-established itself on a different level.

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4. With the disconnection of the frontal lobe, excitatory and inhibitory influences upon the A.N.S. are abolished, which may explain certain clinical observations such as the fall in blood-pressure in hypertensive patients.

5. Frontal lobotomy which, at present, is performed for the surgical treatment of serious mental illnesses, may, in the future, become a method for the treatment of selected cases of hypertension. (Authors' abstr.)

The Effects of Electric Convulsive Therapy on Certain Personality Traits in Psychiatric Patients.

In contrast to the Minnesota and other personality questionnaires which were not helpful as diagnostic or prognostic aids, the perceptanalytic test of Rorschach was a valuable prognostic and diagnostic aid. The Rorschach findings paralleled the personality changes observed clinically. Even before treatment there was a significant difference between the Rorschach records of improved and unimproved schizophrenics treated with ECT.

The improvement after shock therapy seemed to depend on two different factors. One condition for improvement was the presence of only mild or no intellectual regression. In other words, the patient's intellect should not be markedly affected by the psychosis. The other condition was that there be a marked discrepancy between the potential and the actual level of the schizophrenic's mental or psychological functioning. The greater this discrepancy, the greater the improvement seemed to be, other conditions being equal.

According to the Rorschach findings, the discrepancy between the potential and actual mental functioning was apparently correlated with the schizophrenic's anxiety endangered by his awareness of the personality changes which had taken place as a result of the psychosis. To use simple language, many schizophrenics "exaggerate" the effect of the psychosis upon their personalities. They become unduly anxious and withdrawn in an apparent attempt to minimize the chances of maladjustment and conflict with the environment. Some become anxious and agitated, as if trying to escape painful insight into their personality deficiencies by means of a vigorous and usually sudden increase in motor activity. The patients seem so preoccupied with their anxiety and what might be termed their attempts to cure themselves of the anxiety that they neglect to function as well as they could in objective reality and in social relationship. If anxiety and depression are secondary results of the psychosis, then successful shock therapy removes these secondary effects of schizophrenia. According to available Rorschach evidence, schizophrenics whose actual psychological performance level is near their potential level do not improve even when these patients show very few, or no primary intellectual deficiencies caused by the psychosis.

The following personality changes have been observed in schizophrenics by means of the Rorschach method after a successful treatment: the patients became much more concise; they were less circumstantial; the logical coherence of their reasoning was improved. There was usually a definite improvement in the capacity for consciously directed and prolonged voluntary attention. They showed more control in thought and action. They were emotionally calmer and less sensitive. At the same time they appeared emotionally duller. These results probably can be explained fully by a decrease of emotional pressure. The decrease in anxiety and depression reacted favourably upon intellectual functioning. Thus, although there seemed to be no real improvement in intellectual capacity, the improvement in intellectual efficiency was very noticeable. The decrease in anxiety through successful treatment resulted in a lesser stimulation of imagination, and thus revealed more clearly the emotional impoverishment of the schizophrenic.

Finally, as far as the perceptanalytic test of Rorschach is concerned, there seemed to be no difference in its prognostic value whether used in insulin coma treatment or in ECT. (Authors' abstr.)

Effects of Cerebral Electroshock on Experimental Neuroses in Cats.

Six cats were made experimentally neurotic, and were then subjected to cerebral electroshocks comparable to those used in clinical therapy. All of these animals showed a marked disintegration of inhibitions, phobias, compulsions and other neurotic patterns, with emergence of simpler, more normally readaptive behaviour,

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which could be further improved by guidance, retraining, and other corrective procedures. However, all of the neurotic animals and two normal controls subjected to the electroshocks also showed an impaired capacity for complex adaptations, with subsequent recovery in only two of the animals. In no case, however, could these deficits be correlated with corresponding histopathologic changes in the brain. The significance of these observations in relation to the clinical use of shock therapy is briefly discussed. (Authors' abstr.)

Electroshock Therapy. A Review of over 23,000 *Treatments using Unidirectional Currents.*

1. Forty per cent. of the most chronic patients showed significant improvement in ward behaviour if adequately and repeatedly treated with suitable type of electroshock therapy. Relapses must be treated whenever they occur over months and years.

2. At least 60 per cent. of early cases, aged 60 or under, were rehabilitated within one year when adequately treated, and 65 per cent. by the end of the second year after the start of treatment.

3. Adequate treatment means intensive treatment until the expected improvement has occurred, and intensive treatment of relapses when they occur. No patient, otherwise suitable who is still not rehabilitated after one year, has had an adequate trial of treatment with less than 20 treatments.

4. An ideal therapy is one which achieves beneficial results without causing accumulating brain damage, thus permitting its use repeatedly for years if necessary.

5. This ideal is approached by the relatively low intensity 60-cycle pulsating direct current used in the treatment of the patients reviewed in this paper. This technique also has been accompanied by an exceptionally low percentage of skeletal complications. (Author's abstr.)

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The Advantages of Nitrous Oxide Inhalation in Psychiatric Treatment.

1. Previously described methods of inhalation anaesthesia and hypoxia in psychiatric conditions have been reviewed.

2. A technique of nitrous oxide administration beyond the state of intoxication and avoiding the stage of deep hypoxemia has been described.

3. Physiological changes with this form of anaesthesia are slight and the method may be considered safe.

4. After the anaesthesia, a period of facilitation of mental processes is observed, which is followed by a period of relaxation and sedation.

5. During the phase of facilitation the patient has a feeling of increased well-being, and shows greater spontaneity, less resistance, and enhanced insight, often expressing previously repressed ideational content and affects.

6. The period of sedation lasts for several hours, and is not associated with drowsiness or confusion. Sleep is usually improved the following night and other sedation is often unnecessary.

7. In states of acute manic excitement, repeated daily administration of nitrous oxide has controlled and terminated the attack in some cases.

8. Nitrous oxide hypoxia produces some of the features of the " shock treatments " as well as of narcoanalysis, but it is safe, convenient, and simple in admini-

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stration, and may be used in ambulatory patients without interruption of their ordinary activities.

9. The theories on the pharmacological action of nitrous oxide and the reason for its choice are discussed. (Authors' abstr.)

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Five-Year Results of Shock Treatment. *Hinko, E. N., and Lipschutz, L. S.* 244
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Psychopharmacologic Study of Schizophrenia and Depressions.

From these data it would appear that the lactic and the pyruvic acid contents of venous blood and their ratio do not differ significantly for patients with either depression or schizophrenia from the values for normal controls under basal conditions. The data, furthermore, suggest that the intravenous administration of sodium amytal in a dosage of 250 mg. is not sufficient to change significantly any of these values. This experimental approach does not assist, therefore in the elucidation of the differential response of the two groups of patients to this drug.

Although there is no essential difference in the general condition of the oxidative reactions as so determined among the two groups of patients and the normal controls, the possibility of other metabolic disturbances is not eliminated. The data simply suggest that general metabolic disturbances may be sought either before or after the pyruvate : lactate phase in the carbohydrate oxidation-reduction system. Neither is the possibility of more specific metabolic disturbances in the central nervous system eliminated. For such studies, blood should be obtained from both the carotid artery and the jugular vein.

The values for the lactic acid of the blood here reported are lower than those recorded elsewhere in the literature, probably as the result both of the method used and of the basal state of the subjects. (Authors' abstr.)

The Electroencephalogram in Encephalitis.

The electroencephalograms in 240 cases of encephalitis were studied in various stages of the disease. It was found that abnormality is often focal, and that it correlates with the stage of the disease. During the acute and subacute phases it correlates with the general severity of symptoms. However, the only feature of the postencephalitic syndrome which correlates highly with electroencephalographic abnormality is the presence of convulsions.

The electroencephalogram has diagnostic value for encephalitis, and after the acute phase is past it has prognostic value for postencephalitic epilepsy.

Wave and spike activity of the *petit mal* type is a common sequel of encephalitis in children. (Authors' abstr.)

Effect of Electrically Induced Convulsions on Peripheral Venous Pressure in Man.

Electrically induced convulsions cause marked transitory elevations in venous pressure consequent to muscular straining, the Valsalva phenomenon, increased carbon dioxide tension of the blood and possibly also increased circulating epinephrine. After termination of the seizure the venous pressure remains slightly

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elevated. It is concluded that the pronounced increases in venous pressure are of such short duration as to create little hazard of inducing intracerebral capillary haemorrhages. That other hazards exist is, however, recognized. It is concluded that the marked rise in venous pressure and the circulatory changes associated with it are not essential to obtaining clinical improvement. (Authors' abstr.)

Psychosis During Withdrawal of Morphine.

While it appears that withdrawal of morphine is not sufficient in itself to cause a psychosis, it is apparent that it may intensify the symptoms of a psychosis that already exists; this was demonstrated by the patients who had a psychosis prior to withdrawal. It is interesting that in the case of a schizophrenic addict who had withdrawal of morphine alone, the increased vividness of the delusions and hallucinations together with the disorientation resulted in the picture of a toxic psychosis.

It is of course impossible to know how much the withdrawal of morphine contributed to the picture of the toxic psychosis apparently produced by alcoholism and barbiturates; there is little doubt that at least anxiety was increased.

In view of the fact that so large a percentage of persons with addiction to morphine have severe neurotic traits, it is curious that more do not become psychotic during withdrawal of the drug. The withdrawal of morphine, even with the best medical care, is a rigorous anxiety-producing experience. These facts perhaps lend support to the thesis that the psychoneuroses and the psychoses are not a continuum, but, rather, are distinct entities. The development of delirium in the first schizophrenic addict suggests a close relation between schizophrenia and toxic psychosis.

The findings in this study indicate that withdrawal of morphine, of itself, is rarely, if ever, a cause of psychosis. In each instance complicating factors (schizophrenia and various types of organic psychoses) accounted for the psychosis during withdrawal. It must be noted that rapid withdrawal (10 days) is the method usually employed, and that with quicker withdrawal more instances of psychoses would perhaps have occurred. Yet Himmelsbach and Williams found, during the abrupt withdrawal of morphine from 400 addicts under close supervision so that no other drugs could be used, only one patient who became obviously psychotic. (Author's abstr.)

SEPTEMBER.

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Physiology and Therapy of Convulsive Disorders: (1) *Effect of Anticonvulsant Drugs on Electroshock Seizures in Man.*

Data are presented on the ability of anticonvulsant agents to prevent tonic-clonic seizures in non-epileptic patients undergoing electroshock therapy.

Diphenylhydantoin in non-toxic doses consistently abolishes the tonic phase of electroshock seizures. "Mesantoin" (N-methyl, 5-phenyl, 5-ethyl hydantoin) also ranks high in ability to modify the pattern of convulsions. Phenobarbital, sodium bromide and "mebaral" (N-methyl, 5-phenyl, 5-ethyl barbituric acid) are effective, but only in doses which occasionally produce undesirable side effects. "Tridione" (trimethadione) is ineffective in modifying the electroshock seizure pattern when given in doses more than adequate to control clinical *petit mal* epilepsy.

It is suggested that the modification of the electroshock seizure pattern in man offers a convenient method for the evaluation of potentially useful anticonvulsant drugs. (Authors' abstr.)

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Influence of Anxiety on Attention, Learning, Retention and Thinking.

A group of tests were selected for the study of active and passive attention, learning, retention, immediate memory and thinking. The reliability was established in all tests which were used in this study.

Anxiety appears to decrease active attention, as measured by the longest span of digits before an error is made. Passive attention as studied by the recall of the number of units of the " Barn Story " was affected adversely by intense anxiety. The effect was less clear when anxiety was not intense. Learning on the maze test was reliably slower in the presence of anxiety. Retention ability, tested by repetition of the maze test 24 hours after it was learned, was affected unfavourably by anxiety. Thinking was studied by means of the Kohs Block Test. It seems that anxiety decreases the score significantly with most patients, but there is a small group which is influenced little. The influence of anxiety in the different experiments was not uniform. It may happen that one or the other of the aforenoted functions is affected little, whereas all or the majority of the remaining functions are affected to a pronounced degree.

The possible influence of anxiety on the various functions which are tested in the current type of psychiatric examination has to be considered more seriously than has been done heretofore. It may be possible to gauge the intensity of anxiety from the findings. It is necessary, however, that the technic of the examination be refined by a careful scoring of the " Cowboy Story " test, and by the inclusion of additional tests which have been found useful and reliable in psychologic study. (Authors' abstr.)

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Penicillin in Treatment of Neurosyphilis.

Criteria for evaluation of therapeutic success in neurosyphilis are discussed.

One hundred and fifty-one patients with active neurosyphilis were treated exclusively with intramuscular injections of penicillin every 3 hours, the dose and the length of therapy being varied.

One hundred and thirty-five patients (90 per cent.) responded satisfactorily; 100 of these were followed for 12 months or more. The longest period of observation was 28 months.

The optimum dose of penicillin is yet to be established, but the authors' experience has led them to adopt a schedule of 40,000 units injected intramuscularly every 3 hours for 150 doses, a total of 6,000,000 units. (Authors' abstr.)

The Electroencephalogram in Poliomyelitis.

1. No definite or consistent electroencephalographic changes which might indicate abnormal electrocortical activity were observed prior to the onset of fever or paralysis in monkeys given intracerebral injections of either the RMV or the Aycock strain of simian poliomyelitis virus. Abnormalities in the electroencephalogram appeared during the paralytic stage and became more conspicuous with the progression of symptoms. The electroencephalographic changes consisted chiefly in a progressive increase of slow activity, disappearance of alpha rhythm, a relative increase in the amount of fast activity and a lowered voltage output.

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2. No electroencephalographic abnormalities were noted in guinea-pigs given either intracerebral or peripheral injections of murine poliomyelitis virus in the presence or absence of paralytic symptoms.

3. Of 17 patients convalescent from poliomyelitis, all of whom had severe residual paralysis, 2 exhibited definite electroencephalographic abnormality and 5 showed a borderline disturbance. The remaining 10 patients had normal electroencephalograms. (Author's abstr.)

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The Psychiatric Manifestations of Temporal Lobe Lesions.

1. Mental aberrations are of common occurrence in cases of tumour of the temporal lobe. They include changes in personality, disturbances in affect, disturbances in intellectual and higher psychic functions, and hallucinations of vision, hearing, taste, and smell.

2. Certain of these psychic changes are identical, and it would seem indistinguishable from those seen in frontal lobe disease. Apparently the so-called " prefrontal lobe syndrome " is common to both temporal lobe tumours and tumours of the frontal lobe, but is presumed to be more specific for the frontal lobe group.

3. There is some evidence suggesting that the type of clinical picture which develops concurrently with brain tumour is influenced by the premorbid personality of the patient regardless of the site of the lesion.

4. It seems clear that a regional diagnosis of temporal lobe tumour cannot be made from the presence of psychic disturbances alone, but if an intracranial tumour is known to exist from other clinical data, neurologic and otherwise, the concomitant mental changes may be of some value in localizing it.

5. Mental symptoms following ablation of the right temporal lobe are relatively unimportant, and seem confined to a reduction in drive, some slowing of the mental tempo, and minor disturbances in memory. Therefore, one must conclude that the effects of irritation are much different from the effects of ablation.

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6. It has been rather conclusively demonstrated that intracranial hypertension itself does not produce a qualitative change in the psyche. Torpor should be considered only as a quantitative impairment of consciousness and should be excluded.

7. Symptoms of right temporal lobe disease center about the functions of vision, hearing, taste, and smell. Hallucinatory phenomena arise out of excitation of these centres, and are sometimes accompanied by peculiar and rather distinctive dream-like states.

8. Visual hallucinations are commonly reported to occur with tumours of the temporal lobe, being characteristically observed in the field of vision contralateral to the tumour, or, when hemianopia is present, in the blind field. These hallucinations tend to be of the complex, highly-organized type in contradistinction to the simple unformed hallucinatory phenomena reported in cases of occiptal lobe tumour.

9. Auditory hallucinations are likewise seen in cases of temporal lobe tumour and are reported as being of complex, highly-organized character.

10. Hallucinations of vision and hearing occurring with temporal lobe tumours are usually accompanied by insight as to their real nature on the part of the patient.

11. In patients who have hallucinations of taste and smell and who prove to have organic intracranial disease the lesion is said invariably to be situated in the temporal lobes.

12. Much of the confusion over the significance of mental changes in temporal lobe lesions stems from the lack of complete premorbid, morbid, and post-operative psychiatric study by a psychiatrist, of patients suspected of having brain tumour.

(Author's abstr.)

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Experimental Catalepsy in the Rat Produced by a Steroid Hormone.

Desoxycorticosterone acetate injected intraperitoneally in large doses in immature female white rats produces a state of experimental catalepsy. This may be observed to occur either alone or in association with deep anaesthesia. In the latter case the catalepsy precedes and follows the period of anaesthesia. The intraperitoneal injection of pentamethylenetetrazol (metrazol) antagonizes the cataleptic effect of the steroid hormone. (Author's abstr.)

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GENET. PSYCHOL. MONOGR.

VOL. XXXV. MAY, 1947.

*A Continuation Study of Anxiety Reactions in Young Children by Means of a Projective Technique. *Dorkey, M., and Amen, E. W.* . . . 139
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A Continuation Study of Anxiety Reactions in Young Children by Means of a Projective Technique.

In summary, one may conclude that the data have yielded several significant findings.

The investigation has shown (*a*) that the equivocal pictures have definite value in discriminating between the child with a low anxiety score and the child with a high anxiety rating; (*b*) that a group of unselected normal children tend to associate anxiety, with a high degree of frequency, with certain specific areas of experience, especially with the field of child-child relationships, and that even though anxiety in this area decreases over a period of months, it is still the area of greatest anxiety for the majority of the children studied. (*c*) That the test is a good instrument for measuring anxiety is shown by the Rho for the odd-even split half correlation, which was ·95. (*d*) Rho for the retest correlation, ·22, shows that the test is sensitive to the changes that have occurred in the child's thinking and feeling. The correlation coefficient of ·44 for the older children, between test and retest, indicates a measure of reliability which is greater than is at first apparent, when one remembers that a projective test, to be of value, must indicate significant changes in individual thinking and feeling, when they occur. (*e*) The correlation of ·59 between test results and teacher ratings shows that there is positive relationship between test results and behavioral patterns.

(Authors' abstr.)

VOL. XXXVI. AUGUST, 1947.

*Maze Test Validation and Psychosurgery. *Porteus, S. D., and Peters, H. N.* 3

Maze Test Validation and Psychosurgery.

1. Taking all 55 patients together there is a decided and significant decline in Maze Test performance after lobotomy.

2. The decline is most marked if the first post-operative examination is given within one month of lobotomy, is somewhat less marked if 1 to 1½ months has elapsed, and is considerably less if the interval is longer than 1½ months. These tendencies to relatively smaller declines with time are apparently associated with improved planfulness. Practice effects are, however, greatly reduced in comparison with what happens in normal cases.

3. When the patients are divided into three groups on the basis of improved social adjustment and the Maze is repeatedly applied the two improved groups, though suffering the greatest initial decline, make larger subsequent gains than the unimproved group. The much improved patients finally excel the middle group. These statements relate to averages of performance.

4. When the number of applications of the test is disregarded and scores tabulated for stated intervals there is, except at one point, a steady rise in test age on successive applications, but not until the sixth testing does the average rise above the prelobotomy level.

5. After operation, patients have a greater tendency to repeat errors in successive trials in the Maze. The greatly improved group have again the best record when all post-operative performances are summated. If only the third, fourth and fifth applications of the Test are combined the difference in favour of the improved groups is still more striking.

6. What are called " shatter " effects are more characteristic of the unimproved group than of the other two groups of improved patients.

7. The improvement in qualitative performance in the Maze is most marked for the greatly improved group.

The conclusion seems inescapable that the Maze Test is very significantly sensitive to changes in intelligence following lobotomy. The correspondence

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between clinical observations and test performance also indicates clearly that recovery of planfulness is reflected in successive Maze Test applications.

Perhaps a final disclaimer should be made. In spite of the fact that the Porteus Maze has in the authors' opinion met all the validating criteria set up as the result of lobotomy, that is not the main lesson of this study. To their minds it is the conclusion that whether or not we consider planning and foresight essential to any description of intelligent behaviour, the effects of lobotomy demonstrate clearly that these traits are essential to social adaptation. Whether the Maze is adequate for carrying such an important diagnostic burden is another question.

Twenty-five years ago Yerkes remarked to the senior author of this monograph : " If psychologists would only pay less attention to Binet-measured functions and devote a more reasonable share of their efforts towards developing tests of other socially essential traits, the whole problem of objective testing would be much nearer satisfactory solution." That statement is true to-day. Development of better tests of planning, foresight and initiative than the Maze is one of the urgent tasks that face clinical psychologists in the future. Psychosurgery offers a unique opportunity to validate these forthcoming tests. Unfortunately, planning and foresight do not seem to be among the conspicuous qualities of psychologists ; otherwise, such a diagnostic responsibility would not have been necessary to impose on a single test scale. (Authors' abstr.)

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An Experimental Study of the Effects of Sodium Amytal Upon Performance on the Hunt-Minnesota Test for Organic Brain Damage.

A significant difference was not established between the mean score of deterioration sensitive tests given to 40 student nurses after hypodermic administration of one and one-half grains of sodium amytal and that from tests of the same girls given without the drug. For the 40 cases the critical ratio was 0·84. In other words, the results of this study seem to indicate that sodium amytal when given subcutaneously in small sedative amounts probably does not have a clinically significant effect upon mental efficiency. Since sodium amytal is a representative barbiturate, it seems likely that the barbiturates do not interfere to an appreciable extent with intellectual capacity unless the patient shows clearly discernible signs of sedation. (Author's abstr.)

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A New Method of Measuring Emotional Stability.

1. Various measurements were taken from the finger plethysmographic records of 30 normal subjects, to whom was also administered the Bell Adjustment Inventory.

2. By means of factorial analysis three factors were determined, viz. (*a*) emotional stability, common to the Bell variables and the rate of finger volume change, (*b*) a possible emotional tension factor, highly loaded in absolute pulse volume before the tasks, and (*c*) a factor specific to the cold water test.

3. The results of the factor analysis, the correlation of ·409 between Bell emotional adjustment and R, as well as the partial correlation of ·687 between the above named variables when the effects of Factor 2 were eliminated, show that the rate of the reflex finger volume change (R) is a valid measure of emotional stability (as tested by the Bell Inventory).

4. The comparison of two groups consisting of labile and stabile subjects using the Bell Inventory as criterium shows that R differentiates between individuals who are emotionally stable and unstable.

5. If the effect of absolute pulse volume before tasks (P) is eliminated from the individual R scores, the correlation between R and Bell emotional adjustment increases from ·409 to ·504.

6. An R score of ·200 was found to be an effective norm for diagnosing emotionally unstable individuals.

7. The Goetz finger plethysmograph proves to be a useful means of measuring emotional stability. (Authors' abstr.)

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*Autonomic and Somatic Reactions Induced by Stimulation of the Cingular Gyrus in Dogs. *Kremer, W. F.* 371

A Study of the Effects of Anaesthesia and Asphyxia on the Mono-synaptic Pathway through the Spinal Cord.

The anaesthetic nembutal, though depressing the activity of all components of the mono-synaptic pathway, produces a block in transmission essentially by stabilizing the motoneurone membrane so that the synaptic potential no longer initiates the discharge of impulses.

Asphyxia produces a brief depression, which is quickly followed by a period of hyperexcitability attributable to depolarization of the membranes of the afferent nerve fibres and the motoneurone somas. With continued asphyxia the depolarization progresses so that eventually there is failure of impulse propagation. This first becomes evident with orthodromic impulses in the presynaptic fibres and later with the antidromic propagation from axon to soma. Presumably variations in oxygen requirement determine this order of failure of the components of the pathway.

Oxygen-lack has the same effect as asphyxia except for the absence of an early transient depression of activity which precedes the phase of hyperexcitability.

Sudden readmission of oxygen during the period of asphyxial or anoxic hyperexcitability results in a depression.

Carbon dioxide excess produces pure depression of the mono-synaptic pathway. The accumulation of carbon dioxide explains the early depression in asphyxia, and, together with less diffusible products of anoxial metabolism, it accounts for the depression on sudden readmission of oxygen. During the period of hyperexcitability this depressant action would be submerged by the preponderating excitatory action of the partial depolarization. (Authors' abstr.)

The Electroencephalogram after Prolonged Brain Asphyxiation.

The EEG was recorded at regular intervals after asphyxiations of the brain of 10 to 30 minutes' duration.

The EEG after the shorter asphyxiations was characterized by short (1–2 seconds' duration) bursts of activity, with a wave-frequency of 7 to 12 seconds, repeated 10 to 20 times per minute. Evidence is presented for the cortical origin of these bursts.

The EEG after the longer asphyxiations is characterized by spindles of activity of longer (10 to 20 seconds) durations, with a wave-frequency of 12 to 16 seconds, which are repeated with intervals varying from a few seconds to about one minute. Evidence is presented for the view that the source of the potentials recorded as spindles is an unidentified subcortical structure centrally located in the brain.

(Author's abstr.)

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Autonomic and Somatic Reactions Induced by Stimulation of the Cingular Gyrus in Dogs.

In five dogs the cingular gyrus was exposed by partial ablation of the opposite cerebral hemisphere. Electrical stimulation of moderate intensity or chemical stimulation with acetyl-beta-methylcholine produced responses in the somatic as well as in the autonomic realm. The experimental results suggest the existence of different functional areas in the cingular gyrus. Bladder contractions and other autonomic reactions can be obtained from the caudal third of the gyrus. Less conspicuous and of different character are the blood pressure and respiratory reactions obtained from the rostral third. The middle portion yields inconstant autonomic responses.

Stimulation of the rostral part usually suppresses the activity of somatic musculature, but may at times, as observed in one dog, evoke a slow tonic bilateral extensor reaction. This may indicate a connection with the striopallidum.

A definite interpretation of these reactions as to the significance of the cingular gyrus in the normal performance of either biological or psychological functions should await further research into this area. (Author's abstr.)

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*Reflex Development in the Chronically Spinal Cat and Dog. *McCouch, G. P.* 425
*Mechanism of Nerve Conduction Block Produced by Anticholesterinases. *Toman, J. E. P., et al.* 429

Further Observations on the Spreading Depression of Activity in the Cerebral Cortex.

A slow voltage variation having a duration of 4 to 6 minutes accompanies the spreading depression of activity in the rabbit's cerebral cortex. Each cortical region first becomes negative with respect to an extracortical reference electrode for 1 to 2 minutes. This negativity reaches, within 0·5 to 1 minute, a maximum of 8 to 15 mv. and then decreases somewhat more rapidly. The region then becomes positive for 3 to 5 minutes, this phase having usually a smaller amplitude than the negative.

A sudden cortical anemia, resulting from a 1-minute arterial occlusion, abolishes the " spontaneous " electrical activity of the cortex without itself inducing a slow voltage variation, but it promptly and profoundly alters the slow voltage variation accompanying the spreading depression of activity. This alteration consists essentially of a prolongation and an increase of the negativity. In a cortex, in no part of which a spreading depression of activity is in progress at the time, interruption of the circulation for longer periods induces a slow voltage variation only 2·5 to 5 minutes after the arterial occlusion, at which time the cortex becomes negative. The cortex then remains negative for as long as the circulation is interrupted (up to at least 12 minutes).

If the prolonged anemia is started while a region is involved in a spreading depression of activity and exhibiting the slow voltage variation, then the negativity, promptly induced in the region, persists for as long as the arteries are occluded (up to 12 minutes).

The results seem to indicate that in the spreading depression of activity, a change of the same nature as one resulting from prolonged interruption of the circulation occurs in the cerebral cortex. The electrical sign of this change is the negative voltage variation. (Author's abstr.)

Tectal and Bulbopontine Eyelid Reflexes and Mechanism of the Sleeping Attitude of the Acute Thalamic Pigeon.

Previous reports have shown that the superficial layers of the avian tectum opticum contain neurones which produce an opening of the contralateral eye

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when locally strychninized or faradized. In the present paper the influence of these neurones on the palpebral opening reflexes and their relationships with the cerebral hemispheres and with the bulbopontine centers have been investigated in thalamic and hemidecerebrated pigeons and owls. In addition, an attempt has been made to elucidate the mechanism of the well-known sleeping attitude described by Rolando and Flourens in the acute decerebrated pigeon.

1. After subliminal strychninization of the tectal eyelid neurones a lowering of the threshold for tactile, labyrinthine and acoustic palpebral reflexes has been observed in the contralateral eye.

2. After acute extirpation of a cerebral hemisphere in a chronic hemidecerebrated pigeon lowers the threshold for the opening eyelid reflexes is lower in the eye contralateral to the hemisphere first removed. This reflex asymmetry is not prevented by local chloroforming or by total extirpation of the optic lobe ipsilateral to the hemisphere first removed.

3. Hypnotic doses of chloralose (and also of urethane and dial) injected in chronic, hemidecerebrated pigeons close the crossed "decerebrated" eye, as if the animal were sleeping on this side only.

4. Abolition of the faradic and strychnine excitability of the tectal lid neurones by local chloroforming does not increase the threshold of the lid reflexes in the contralateral eye; on the other side the total unilateral removal of an optic lobe in the thalamic pigeon is never followed by the appearance of lid asymmetries.

(Author's abstr.)

Reflex Development in the Chronically Spinal Cat and Dog.

The course of development of reflex activity after spinal transection has been followed in 34 cats and 17 dogs.

Differences between the two species are noted in regard to reflex pattern, duration of spinal shock, degree of atrophy, and susceptibility to ulcers.

(Author's abstr.)

Mechanism of Nerve Conduction Block Produced by Anticholinesterases.

DFP and eserine, like procaine but unlike KCl, were found to produce conduction block in frog sciatic nerve in concentrations which did not reduce the demarcation potential.

DFP, eserine and procaine consistently increased threshold prior to conduction failure. DFP also increased threshold in concentrations which were inadequate to block conduction. These effects were demonstrable at the stimulating cathode. KCl consistently decreased threshold in frog sciatic nerve during progressive conduction failure.

DFP, eserine and procaine decreased conduction velocity concomitantly with increase in threshold. Conduction failure occurred when conduction time was approximately doubled. In contrast, KCl had little effect on conduction velocity.

DFP and eserine had relatively little effect on recovery of excitability until the terminal stage of conduction block, at which stage they abolished the supernormal period of excitability in the remaining conducting fibers. Most of the above actions were reproduced in single giant fibres of the ventral cord of the earthworm, with the exception that KCl failed to decrease threshold. In addition, it was found that action potential amplitude remained relatively normal until conduction block was imminent in earthworm preparations treated with DFP, eserine or procaine. In contrast, KCl progressively reduced action potential amplitude.

High concentrations of acetylcholine were without effect on properties of frog sciatic nerve when applied during the course of DFP action or after recovery from DFP block. Frog sciatic nerve was found to accelerate the hydrolysis of DFP, probably through an enzymatic action. Partial recovery of conduction was found to occur in frog sciatic nerve even after prolonged DFP block. It is concluded that DFP and eserine in high concentrations abolish nerve conduction by increasing the excitation threshold, and it is suggested that this action may be unrelated to the anti-cholinesterasic activity shown by these drugs in lower concentrations. It is further concluded that these observations do not support the conception of an excitatory role of acetylcholine in the propagation of nerve

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impulses, since conduction block by DFP or eserine was accomplished without the intervention of depolarization or of excitatory effects, contrary to the implications of the acetylcholine hypothesis. (Authors' abstr.)

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The constitutional and psychological symptoms of 30 cases of depression and anxiety in middle-aged males are described.

The relationship of this clinical picture with the so-called male climacteric is discussed.

On the basis of physiological, psychological and therapeutic considerations their relationship is positively established.

It is shown that hormonal treatment relieves the patient of his constitutional symptoms in every case. The relief of the physical complaints has a beneficial influence on the emotional manifestations, and if these are mild they may disappear completely. If the psychological changes are very severe, however, hormonal treatment is insufficient and deep psychotherapy or electric convulsive treatment is necessary. (Authors' abstr.)

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Dictatorship of the Psychopaths. (*2nd rev. ed.*) *Nissen, I. Oslo: Aschehoug,* 1946. *pp.* 255. *N. Kr.* 10.

Nissen's analysis of the psychology of German fascism affords the hypothesis that psychopathy is the ground of fascistic ideology. Its power-policy is a rationalization at large of the psychopathic aggression characterizing the Nazi leaders. Profiting from his many years of experience as a psychotherapist of the Adlerian school, Nissen discusses the psychopathic behavior, described as a remarkably irrational struggle for gaining power in all life situations. In a social group psychopaths will automatically endanger democracy. The Nazistic attitude, with its tremendous aggressive force, its untrue propaganda, its policy of intrigue, etc., is formed as compensation for social insecurity. The affinity among the members of such a group is increased by its patriarchic structure. Analyzing historical and sociological trends in the German "Volk," the author finds the development of "men-groups" prevailing, with its ideology of masculinity and ascetism, potential and manifest homosexual tendencies, and the truncation of the function of females except that of child-bearing. F. FLUGE (Psychol. Abstr.).

Potentiometric Micro Method for the Determination of Cholinesterase. Delaunois, A. L., and Casier, H. [*Experientia,* **2**, 147–8 (1946); *cf. C. A.*, **40**, 4759[1].]

The authors re-emphasize the fact that the use of the Sb electrode offers a more simple, even if less exact, method of measuring cholinesterase than the glass electrode. They believe the use of 0·2 c.c. of serum is not a disadvantage, and that the method of Sanz using 0·05–0·01 c.c. should be designated a micromicro method. They correct an error in the text, stating that N/200 should read 0·02 *N*.

C. RIEGEL (Chem. Abstr.).

Blood Cholinesterase. Augustinsson, Klas Bertil (*Stockholms Hogskola, Biochem. Inst., Sweden*). [*Arkiv. Kemi, Mineral. Geol. A* 18, *No.* 24, 16 *pp.* (1945) (*in English*).]

Cholinesterase from serum (I) and erythrocytes (II) were compared. (I) is stable over a wider range of pH (6–10) than is (II) (pH 7·18–8·12). At neutrality (II) migrates twice as fast as (I). (II) has an isoelectric point of 4·65–4·70, while (I) has one of 4·36. Both are closely related to albumin. (I) may be prepared from serum as follows: $(NH_4)_2$–SO_4 is added to 50 per cent. saturation, thereby removing globulins; the filtrate is brought to pH 4·5 removing albumin; (I) is precipitated from the filtrate with $(NH_4)_2SO_4$ at 70 per cent. saturation. While the action of erythrocytes on acetylaneurine was not proven, evidence was found indicating that the factor in serum which hydrolyzes acetylaneurine is the same factor which destroys acetylcholine. A. J. G. (Chem. Abstr.).

Action of Some Vitamins on Acetylcholinesterase. Reggianini, O. (*Univ. Bologna, Italy*). [*Boll. soc. ital. biol. sper.*, **22**, 982 (1946).]

Large doses of vitamins were injected into guinea-pigs daily or at various intervals. Vitamins A, D, K and PP had no effect on the acetylcholinesterase activity of the brain. Vitamin B_1 produced an average increase of 27·4 per cent. and vitamin C an increase of 11·7 per cent. in this activity.

HELEN LEE GRUEHL (Chem. Abstr.).

Changes in Activity of Cholinesterase in the Ontogenesis of Mammals. Kakushkina, E. A., and Arkhipova, A. D. (*Biol. Museum, Moscow*). [*Byull. Eksptl. Biol. Med.*, **11**, 533–5 (1941).]

Rabbits at various stages of embryonic and post-embryonic life (up to 1 year) showed a very low level of cholinesterase in 15-day embryos, rising to a maximum

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at 30 days (i.e., near the end of embryonic life), increasing after birth, and reaching adult level after 12 days. In the process of development of individual reflexes, the activity of cholinesterase increases. G. M. KOSOLAPOFF (Chem. Abstr.).

Blood Acetylcholine Content in Unconditioned and Conditioned Stimulation. Prokopenko, V. G. [*Byull. Eksptl. Biol. Med.*, **11**, 326–7 (1941); *cf. C. A.*, **38**, 4299[1].]

Blood acetylcholine was determined (leech-muscle method) in dogs in unconditioned (normal feeding) and conditioned (usual surroundings of feeding) stimulation. After 1–1·5 hours in the first case and 15–20 minutes in the second case the blood began to show acetylcholine-like properties, whereas in a hungry dog it did not react with the leech muscle. Thus during gastric activity dog blood contains a vagus substance which is one of the active humoral factors regulating the activity of the intestinal tract. G. M. KOSOLAPOFF (Chem. Abstr.).

Chemical Nature of the Active Substance Appearing in the Sympathetic Ganglion during Stimulation of its Preganglionic Fibers. Medvedev, V. M. (*Med. Inst., Kazan*). [*Byull. Eksptl. Biol. Med.*, **11**, 432–4 (1941).]

The action of acetylcholine, of excitation of preganglionic fibers, and of "active perfusate" (perfusion fluid from the veins of the sympathetic ganglion collected during excitation of preganglionic fibers) on the sympathetic ganglion of the cat was studied under the influence of either paralyzing (nicotine, atropine) or sensitizing substances (eserine, cocaine). The first class of agents produced a lack of response to electric stimulation of fibers or to "active perfusate"; acetylcholine gave a distinct muscular contraction; eserine sensitized the ganglion only to acetylcholine, while cocaine increased the effects of all three excitation factors. Hence, a substance similar to adrenaline, rather than acetylcholine, is the excitation carrier.

(II) *Senkevich, I. V.* (*State Med. Inst., Kazan*). [*Ibid.*, 435–8.]

From experiments on cats after cutting the post-ganglionic fibers on one side of the animal, thus depending upon blood to carry the stimulating substance to the other side of the animal for manifestation of muscular response to the excitation of preganglionic fibers, the active material can actually be transported by the blood. Sympathin (name given to material which forms during excitation of post-ganglionic fibers) is not identical with this substance, which is also apparently not identical with acetylcholine. Its nature remains open.

G. M. KOSOLAPOFF (Chem. Abstr.).

Inhibition of Creatine Phosphate and Acetylcholine Breakdown in Nerve Extracts by Procaine. Rapp, Gustav Wm. (*Chicago Coll. of Dental Surgery*). [*Arch. Biochem.*, **12**, 13–17 (1947); *cf. The Bur*, **45**, 13 (1945).]

An enzyme system is present in the extracts from the frog sciatic nerve which catalyzes a reaction between acetylcholine and creatine phosphate, and this reaction is inhibited in the presence of procaine. V. L. F. (Chem. Abstr.).

Effect of Acetylcholine and Physostigmine on Tetanic Contraction. Babskii, E. B., and Korenevskaya, O. G. (*Lenin State Pedagogic Inst., Moscow*). [*Byull. Eksptl. Biol. Med.*, **22**, No. 9, 29–32 (1946).]

Acetylcholine and atropine have no effect on tetanic contractions by nerve stimuli of the frog gastrocnemius muscle-ischiadic nerve preparation. Physostigmine antagonizes these contractions, not by inhibition of cholinesterase, but by some other mechanism. Physostigmine seems to inhibit some other enzyme system which causes the hyperirritability; there is no simple relationship between this system and that responsible for absolute and relative contractility of the muscle. Veratrine increases and prolongs the tetanic contractions in concentrations which have no effect on refractivity. H. A. WEGNER (Chem. Abstr.).

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The Action of Acetylcholine on Frog Motor Nerves. Sozer, Furuzan (Univ. Istambul Turkey). [*Compt. rend. ann. et arch. soc. turq. sci. phys. et nat.*, 13 71–3 (1947) (*in German*).]

While the rheobase of frog motor nerves was not altered by 0·1–0·0001 per cent. of acetylcholine (I), the chronaxia of normal and of degenerated nerves was extended by 0·1 per cent. of (I), reduced in 80 per cent. of the experiments by 0·01 per cent. of (I), and extended again in 50 per cent. of the experiments by 0·001 per cent. (I). The extension of chronaxia was accompanied by a reduction of the velocity of transmission. An extension of the chronaxia was produced by 0·01–0·0001 per cent. thiamine. FELIX HAUROWITZ (Chem. Abstr.).

The Role of Acetylcholine in Paraphylactic (Anaphylactic) Shock. Antiparaphylaxis by Tissue Decholinization. Danielopolu, D., and Bruckner, I. (*1-ère Clin. Méd., Bucharest, Rumania*). [*Bull. acad. méd. Roumanie*, **18**, 143–5 (1946).

Experiments were performed on intestine isolated from guinea-pigs prepared 20 days previously with horse serum (I) and egg albumin (II). Addition to the bath of 0·1, 0·4 or 1 c.c. of (I) provoked a strong contraction owing to liberation of acetylcholine (III). Tonus returned to normal after washing and replacement of the Tyrode's solution. After 1–3 repetitions of this procedure no response to (1) was elicited, and addition of (II) was also without result. After 100 γ of (III) was added and the bath changed again, 0·4 c.c. of (II) produced a strong reaction. If (II) were added twice more, the intestine again became insensitive to (I) and (II). After another recholinization (I) provoked a violent reaction. Thus " anti-anaphylaxis " is merely exhaustion of tissue choline and not exhaustion of antibodies. MARSHALL E. DEUTSCH (Chem. Abstr.).

New Facts showing that the Excitatory Action of Adrenaline on the Longitudinal Muscle of the Terminal End of the Guinea-pig Ileum is due to Acetylcholine Liberated Indirectly by the Action of Adrenaline. Danielopolu, D., and Popesco, M. (*1-ère Clin. Méd., Bucharest, Rumania*). [*Bull. acad. méd. Roumanie*, **18**, 66–7 (1946).]

The organ was treated with 883F in a dose sufficient to inhibit the sympathomimetic action of adrenaline (I) without affecting its parasympathomimetic action, after which (I) still produced a contraction of the longitudinal fibers. After atropine, which has an effect opposite to that of 883F, (I) inhibited these fibers. The stimulating action of (I) on the fibers was thus due to the parasympathomimetic action produced by the compensatory cellular response to (I).
MARSHALL E. DEUTSCH (Chem. Abstr.).

Antiacetylcholinolytic and Antiadrenolytic Action of Strophanthin. Danielopolu, D., and Popa, Gr. Gr. (*1-ère Clin. Méd., Bucharest, Rumania*). [*Bull. acad. méd. Roumanie*, **18**, 150–1 (1946).]

By use of a previously described method (*cf.* preceding abstr.), strophanthin is shown to have these actions. MARSHALL E. DEUTSCH (Chem. Abstr.).

Antiacetylcholinolytic and Antiadrenolytic Action of Eserine. Danielopolu, D., and Popesco, M. [*Bull. acad. méd. Roumanie*, **18**, 104–5 (1946).]

By use of a previously described method (*cf.* preceding abstr.) eserine is shown to have these actions. MARSHALL E. DEUTSCH (Chem. Abstr.).

Method for the Study of the Inactivation of Adrenaline and of Acetylcholine in Tissues and the Inactivating Action of Drugs on Cholinesterase and on the Adrenolytic Factors of Tissues. Danielopolu, D., and Popesco, M. (*1-ère Clin. Méd., Bucharest, Rumania*). [*Bull. acad. méd. Roumanie*, **18**, 95–6 (1946).]

A very fine needle is inserted in the femoral artery of a dog, and the minimum amount of adrenaline (I) or acetylcholine (II) which clearly affects carotid pressure is determined. Very slow injection of small amounts of the drug to be tested into the femoral artery is followed by the minimum dosage of (I) or of (II). Inactivation of cholinesterase is then shown by a greater drop in carotid pressure due to (II),

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and inactivation of the adrenolytic factors is shown by a greater rise due to (I). Before and after injection of the drug the effects of injection of (I) and (II) into an artery and into a vein are compared.

MARSHALL E. DUETSCH (Chem. Abstr.).

Influence of Neurine, Acetylcholine and Atropine upon the Lymph Flow in the Thoracic Duct. Yokozawa, Miyuki. [*Acta Schol. Med. Univ. Imp. Kioto*, **24**, 169–96 (1942).]

The intrafemoral or intraportal injection of neurine into dogs resulted in acceleration of lymph flow in the thoracic duct, an increase in albumin of lymph serum, and a higher portal blood pressure. Acetylcholine produced a similar but longer-lasting effect. Atropine counteracted these effects, more strongly those of neurine than those of acetylcholine. All three, however, decreased the volume of the liver and small intestine. After the ligation of the periportal hepatic lymph vessels neurine and acetylcholine still increased the lymph flow, but not albumin of lymph serum. The lymphagogous effect of neurine and acetylcholine depends to some degree on the output of adrenaline. J. G. YOSHIOKA (Chem. Abstr.).

Synergistic Influence of Physostigmine on the Lymphagog Effect of Acetylcholine. Yokozawa, Miyuki. [*Acta Schol. Med. Univ. Imp. Kioto*, **25**, 1–18 (1943).]

In atropinized dogs physostigmine and acetylcholine were shown to act synergistically in raising portal venous pressure and increasing the lymph flow in the thoracic duct and also increasing the volume of the small intestine, but not that of the liver. J. G. YOSHIOKA (Chem. Abstr.).

Electrogenic Properties of Acetylcholine. Barnes, T. C. [*Nature, Lond.*, **159**, 307 (1947).]

The electrogenic action of acetylcholine at the phase boundary between oils and aqueous solutions is discussed as the possible basis of the recorded electrical potential of cholinergic nerve impulses. A. C. HOFFMAN (Psychol. Abstr.).

Influence of Certain Narcotics on the Sensitivity of Leech Muscle to Acetylcholine. Mikhel'son, M. Ya (Viem, Leningrad). [*Byull. Eksptl. Biol. Med. (U.S.S.R.)*, **11**, 230–3 (1941).]

Uneserinized specimens of dorsal and abdominal leech muscle were tested as to sensitivity to acetylcholine in the presence or absence of several narcotics. Morphine at 1×10^{-7} level increases sensitivity to acetylcholine (maximum at 10^{-3}); at 10^{-2} morphine causes its own contractions, owing to suppression of cholinesterase. Codeine was similar to morphine; diacetylmorphine has no such effect; papaverine increases sensitivity at 10^{-4} level. Ether causes considerable increase of acetylcholine sensitivity at 1/500–1/250 levels; $CHCl_3$, however, does not increase acetylcholine sensitivity and at 5×10^{-5} itself serves to relax the muscle; both $CHCl_3$ and Et_2O have strong anticholinesterase actions. MeOH, EtOH, iso-BuOH and iso-AmOH gave the sensitizing effect only for the latter two (iso-AmOH stronger than iso-BuOH), although all four have some anticholinesterase action. Methylene blue is a very strong anticholinesterase agent and strongly sensitizes the leech muscle to acetylcholine. Leech muscle is proposed as the test material for comparative study of anticholinesterase agents.

G. M. KOSOLAPOFF (Chem. Abstr.).

The Mode of Action of Acetylcholine on Unstriated Muscle. Singh, Inderjit, and Singh, Mrs. Sunita Inderjit (Dow Med. Coll., Karachi). [*Current Sci. (India)*, **16**, 159 (1947).]

Acetylcholine and K, in concentrations such that neither alone will produce tonic contraction, together cause tonic contraction in frog-stomach muscle. That the contracture is due to the K is indicated by its continuance when acetylcholine is withdrawn and relaxation when the K is withdrawn.

FERRIN B. MORELAND (Chem. Abstr.).

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Sensitization of Acetylcholine by Thiamine. Carvalho, Paulo de. [*Arquiv. faculdad. nacl. med.* (*Rio de Janeiro*), **1**, 11–19 (1946) (*English summary*).]

The rate of hydrolysis of acetylcholine (I) dissolved in defibrinated dog blood is studied by determination of the blood pressure of anesthetized dogs. Twenty γ (I per ml. blood are completely hydrolyzed within 2–3 minutes. Addition of 0·1 mgm. thiamine (II) simultaneously with (I) prolongs its effect to 5 minutes. If (II) is mixed with the blood 10–15 minutes before addition of (I) its action lasts 12–15 minutes, and if added 30 minutes before, the action lasts 1 hour. These results cannot be compared directly with those conducted *in vivo*.

K. SCHOEN (Chem. Abstr.).

The Chemical Nature of the Substances of Brain Tissue which render Muscles Sensitive to Acetylcholine. Babskii, E. B., and Minaev, P. F. (*Acad. Med. Sci., Moscow*). [*Biokhimiya*, **12**, 231–40 (1947); *cf. C. A.*, **40**, 7258[7].]

The substance which sensitizes brain tissue to acetylcholine is a compound containing a labile phosphate group, and is probably adenosinetriphosphate.

H. PRIESTLEY (Chem. Abstr.).

The Ultraviolet Absorption Spectrum of Cerebrospinal Fluid: Ascorbic versus Nucleic Acid. Strait, L. A., Aird, R. B., and Hrenoff, M. K. (*Univ. of California Med. School, San Francisco*). [*Science*, **106**, 64–5 (1947).]

The 265 mμ band of cerebrospinal fluid (CSF) is shown to be due to ascorbic acid and not nucleic acid as assumed by Spiegel-Adolf and Wycis (*C.A.*, **41**, 1032*f*). The maximum ultraviolet absorption curves of CSF and ascorbic acid is shifted towards the shorter wave-lengths by a change in pH from 7 to 2, whereas a corresponding change in the pH of nucleic acid causes a slight shift in the opposite direction. The 265 mμ band of CSF responds to all decomposition tests for ascorbic acid. The residual absorption after destruction of ascorbic acid gives the so-called "S-shaped normal" curve. The observations of Spiegel *et al.* (*Science*, **105**, 208 (1947)) of the disappearance of the 265 mμ band from a fresh sample of CSF is what one might expect of ascorbic acid, and therefore cannot be accepted as evidence for a chromatolytic enzyme which splits nucleic acids. The ascorbic acid concentration of 80 samples of CSF from normal and abnormal patients ranged from 0·3 to 4·8 mgm. per cent. The ascorbic acid was determined by measuring the absorption before and after its destruction at pH 11, and the values agree with those of Wortis *et al.* (*C. A.*, **32**, 7531[1]).

A. DIETZ (Chem. Abstr.).

The Upper Limits of Normal Protein Concentration in the Cerebrospinal Fluid. Kafka, V. (*Langbro Sjukhus Alvsjo, Stockholm*). [*Monatsschr. Psychiat. Neurol.*, **110**, 325–9 (1945).]

The discrepancies among normal values for protein (I) concentration in the cerebrospinal fluid (CSF), reported from different laboratories, are due in large part to analytical errors. Kafka discusses in detail his procedure (*J. Neurol. Psychiat.*, **115**, 85 (1928)). Precipitation of (I) by Esbach's reagent (II) in special calibrated tubes, centrifugation under carefully controlled conditions, and direct reading of the volume of precipitate globulin (III) is determined by precipitation with saturated $(NH_4)_2SO_4$, centrifugation, careful removal of the supernatant liquid, solution of the residue in NaCl solution, and precipitation with (II) as before. Albumin (IV) is taken as the difference between (I) and (III). (IV) can be determined directly, but this is not recommended. The method for total (I) must be checked by control determinations on different amounts of a CSF of known (I) concentration. The method for (III) is checked by blank determinations on the reagents. The method does not give high precision, but the accuracy is sufficient for diagnostic purposes, and discrepancies between it and the Kjeldahl method (*cf.* Lindenmeyer, *C. A.*, **40**, 105[8]) should not occur. In 95 per cent. of 333 CSF's qualitative agreement was found (normal or not) between Kafka's method and Bisgaard's HNO_3 serial dilution method.

W. M. S. (Chem. Abstr.).

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Application of the Takata Quinine-spinal Fluid Reaction to Blood Serum. Ninni, Mario (*Univ. Pavia, Italy*). [*Boll. soc. ital. biol. sper.*, **23**, 47–8 (1947).]

The test with the modifications for serum is carried out as follows: 1 c.c. of a : 2, 1 : 4, 1 : 8, 1 : 16 and 1 : 32 dilution of serum in physiological saline is placed n tubes and 0·10 c.c. of 0·36 per cent. anhydrous Na_2CO_3 added and shaken;).20 c.c. 2 per cent. aqueous solution of quinine-HCl is added, shaken, and et set for 24 hours. Clear or slightly turbid solutions are considered negative, 1 definite white precipitation is positive. Experiments on 130 serums from various disturbances indicated that this test is a good indication of the eucolloidity of a serum. H. L. GRUEHL (Chem. Abstr.).

Changes in the Cerebrospinal Fluid and Blood in Vernalestival Encephalitis. III. *Disturbance of the Carbohydrate-Salt Metabolism in Acute and Chronic Stages of the Disease.* Mandel'boim, A. B. (*Inst. Physiol., Acad. Sci., SSSR*). [*Byull. Eksptl. Biol. Med.*, **20**, *No.* 12, 42–5 (1945); *cf. C. A.*, **40**, 7362[2]).]

K, Ca, chlorides, and sugar were determined in blood and cerebrospinal fluid of cases with meningeal (I), hemiparetic (II), bulbar (III), polyradiculoneurotic (IV), serous meningitic (V), poliomyelitic (VI), hyperkinetic (VII), and atactic (VIII) syndromes. Except as noted there was no deviation from normal. The K level of the cerebrospinal fluid was variable in (VI) and high in (VII), and of the blood, low in (I). Ca in the fluid was normal to high in (II), (III), (IV) and (VII), and high in (VI) and (VIII). Blood Ca was normal to high in (VI) and (VII). The K : Ca ratio of cerebrospinal fluid and blood was low in (II), (III), (IV), (V) and (VI). Blood sugar was low in (VI), and fluid sugar was low in (I) and (IV) and irregular in (I), (II) and (III). Changes in salt equilibrium and carbohydrate metabolism in such cases are less than in other central nervous system diseases, and are attributed to disruption of the regulatory vegetative-endocrine centers by virus. K. STARR CHESTER (Chem. Abstr.).

Biochemistry of the Sphingolipides. I. Preparation of Sphingolipides from Beef Brain and Spinal Cord. Carter, Herbert E., Haines, William J., Ledyard, W. E., and Norris, William P. (*Univ. of Illinois, Urbana*). [*J. Biol. Chem.*, **169**, 77–82 (1947).]

A study was made of the various procedures reported for the isolation of cerebroside and sphingomyelin from nerve tissue. The procedure adopted involved dehydration with acetone, extraction by ether of the glycerophosphatides in the acetone-extracted residue, extraction of the acetone-ether-extracted residue with alcohol, and the precipitation of the sphingolipides by cooling overnight. One hundred pounds of fresh beef brain yielded 1,300 to 1,600 gm. of a crude sphingomyelin-cerebroside mixture; 100 lb. of beef spinal cord gave 2,200 to 2,500 gm. The total yield of cerebroside was 4·2 per cent. of the fresh weight of the spinal cord; the yield of sphingomyelin was 1·37 per cent. JULIA O. HOLMES (Chem. Abstr.).

Influence of the Thyroid Hormone on the Formation of Mediators in the Central Nervous System. Kakushkina, E. A., and Tatarko, T. [*Compt. rend. Acad. Sci., U.R.S.S.*, **55**, 359–61 (1947) (*in French*); *cf. C. A.*, **41**, 5937*e*.]

Hyperthyroidism induced by feeding large amounts of fresh thyroid to dogs had no effect on the acetylcholine-like substances in the brain; however, the activity of the esterase was diminished; this raises the "acetylcholine coefficient." R. W. FLEMING (Chem. Abstr.).

Content of Calcium in Brain Tissue under Narcosis. Meglitskii, P. P., and Zinov'eva, M. T. (*Inst. Med., Leningrad, U.S.S.R.*). [*Byull. Eksptl. Biol. Med.*, **20**, *No.* 4–5, 32–3 (1945).]

Experiments were carried out to determine the diffusible Ca in the brain before and after 30 minutes of ether narcosis. The animals used were guinea-pigs and rats. For the pigs, the average normal Ca content was 24·8 mgm. per cent.; after narcosis it rose to 41·8 mgm. per cent. For the rats, the average normal Ca content

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was 37·9 mgm. per cent.; after narcosis it rose to 60·4 mgm. per cent. The content of water in the brain remained approximately the same before and after narcosis. S. GOTTLIEB (Chem. Abstr.).

Regulation of Organic Metabolism by the Upper Sympathetic Ganglion of the Neck. Sinel'nikov, E. M., and Bugaeva, M. G. (Ukrain. Research Inst. Stomatol. Odessa). [*Byull. Eksptl. Biol. Med.*, **11**, 442–5 (1941).]

After extirpation of the upper sympathetic ganglion of the neck in young dogs teeth showed no change in inorganic composition (Ca, Mg and P), but there was a fairly regular (up to 3·5 per cent.) increase of the organic constituents.

G. M. KOSOLAPOFF (Chem. Abstr.).

Biochemical Foundations of Abnormal Behavior in Man. Hoagland, Hudson. [*Ciencia e ivest. (Buenos Aires)*, **3**, 229–37 (1947).]

Previous research on the relationship between metabolism, and especially cerebral respiration, and psychic processes and disturbances is discussed. Further the investigations on the connection between hypothalamus function and endocrine glands, ketosteroid elimination, the influence of the adrenals and pituitary on psychic function and enzyme deficiencies are reviewed.

A. E. MEYER (Chem. Abstr.).

Mechanism of the Action of Potassium on Nerve Refraction. Zol'nikova, A. I. (Central Inst. Neurology, Moscow, U.S.S.R.). [*Byull. Eksptl. Biol. Med.*, **20**, *No.* 10/11, 9–12 (1945).]

Sciatic-gastrocnemius preparations were made from the frog, and the absolute and relative refractory periods of the nerve after excitation by a single stimulus were measured. The influence of acetylcholine, KCl and atropine was studied. A 0·2–0·4 per cent. KCl concentration in Ringer's solution prolonged the refractory phase. This prolongation could be antagonized by atropine. Experiments show that the effect of K is due to its ability to release acetylcholine.

S. GOTTLIEB (Chem. Abstr.).

Nervous Regulation of the Anterior Hypophysis. I. Excitants of the Central Nervous System (Picrotoxin and Metrazole) and the Estrus Cycle of the Rat. Ubatuba de Fernando (Inst. Oswaldo Cruz, Rio de Janeiro). [*Rev. Brasil. Biol.*, **7**, 203–14 (1947).]

In adult rats intravenous injections of convulsant doses of picrotoxin or metrazole during or between estrus periods failed to disturb the estrual rhythm or to induce pseudopregnancy. Presumably the drugs do not provoke the release of luteinizing hormone by the anterior hypophysis.

L. E. GILSON (Chem. Abstr.).

Section of the Hypothalamus to Remove the Hyperglycemic Effect of Urethan. De, P. (Med. Coll., Calcutta). [*Indian J. Med. Research*, **34**, 185–7 (1946).]

The persistent hyperglycemia characteristic in the cat under urethan anesthesia gradually subsides after section of the hypothalamus. The plane of section passes from the anterior border of the superior corpora quadrigemina through or behind the mammillary bodies. M. H. POWER (Chem. Abstr.).

Effect Produced by Lesions of the Hypothalamic Region on the Carbohydrate Metabolism. Rusishvili, G. G., and Yankovskaya, Ts. L. (Pavlov Physiol. Inst., U.S.S.R.). [*J. Physiol. (U.S.S.R.)*, **32**, 223–8 (1946) (*in Russian*).]

Lesions were produced in the hypothalamic region of three dogs, and observations on the carbohydrate metabolism were made. None of the dogs under observation showed hyperglycemia. Marked hypoglycemia in the post-operative period coincided with severe general disturbances and epileptic fits. A therapy of massive sugar administrations proved beneficial in these cases.

S. GOTTLIEB (Chem. Abstr.).

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A Method of Screening Sympathomimetic Amines for Stimulant Action on the Cerebrum. Clymer, Nancy V., and Seifter, Joseph (Wyeth Inst., Philadelphia, Pa.). [J. Pharmacol., 89, 149–52 (1947).]

Young chicks react to amphetamine (I) in a characteristic manner. The syndrome produced by injecting 2–5 mgm. of (I) develops in three stages. The first two stages take place 1–2 minutes after the injection, and consist of vigorous head movements and ruffled feathers accompanied by a forward tilt of the body and drooping wings. The third stage, about 3 minutes after the injection, is the crucial test for (I). Under the influence of (I), the ordinary intermittent peeping of the chick becomes a continuous twitter, about 250 times per minute, and sometimes may even become a warble. This twittering reaction may last an hour. Corneal anesthesia and a failure to respond when the toes were pinched were noted at the height of the reaction. Of 60 compounds, including the more commonly used sympathomimetic amines, only *d*-amphetamine, *dl*-amphetamine (benzedrine), *d*-desoxyephedrine, β-phenyl-α-aminobutane, and β-phenyl-tert-butylamine produced the twittering reaction. Of the other compounds some produced none of the above effects, some produced the first two stages, and synephrine and neosynephrine produced lethargy. Other effects of each compound are described. Only chicks 1 day to 3 weeks old showed the twittering reaction with (I). Squabs, pigeons and hens ejected food and the pigeons lost the ability to fly. Canaries exhibited convulsions, and day-old ducklings showed excitement only. Attempts to abolish the syndrome by sympatholytic drugs were in general unsuccessful.

L. E. Gilson (Chem. Abstr.).

A Method of Estimating Curare-like Activity on the Isolated Phrenic Nerve Diaphragm Preparation of the Rat. Chou, T. C. (Dept. Pharmacol., Oxford, Eng.). [Brit. J. Pharmacol., 2, 1–7 (1947).]

The phrenic nerve diaphragm preparation was stimulated to maximum contractions by condenser discharges from a neon lamp circuit, contractions being recorded by isotonic lever. The muscle was immersed in Tyrode's solution fortified with glucose, oxygenated with a stream of 95 per cent. 0–5 per cent. CO_2, the bath being at 37–38° and having a capacity of 100 ml. The Tyrode was changed four times during 13 minutes between addition of drugs. Drugs were allowed to act for 3 minutes. Percentage inhibition was determined by measuring the height of contraction just before tubocurarine was added to the bath, and again 3 minutes later. The curare action is less at slower rates of stimulation (5/minutes) than at faster rates (20/minutes). At rates greater than 20/minutes recovery was slow owing to fatigue. Curare action is less in pure O than in O–CO_2 mixtures. The overall error of the method is about 6 per cent.

Wm. M. Govier (Chem. Abstr.).

Nerve Centers and Sugar Regulation. Marinelli, Luigi, Giunti, Valentino, and Discepoli, Giuseppe (Univ. Perugia). [Arch. sci. med., 83, 174–80 (1947).]

Measured quantities of glucose were injected into the spinal canal in dogs. This was followed by a decrease in blood sugar with a min. after 30 minutes. Return to normal occurred after 2 hours. Conclusion: Glucose stimulates nervous centers directly.

A. E. Meyer (Chem. Abstr.).

Adenylpyrophosphatase in Brain, Liver, Heart and Muscle of Chick Embryos and Hatched Chicks. Moog, Florence (Washington Univ., St. Louis, Missouri). [J. Exptl. Zool., 105, 209–20 (1947).]

Adenylpyrophosphatase (I) activity was followed in the organs of the developing chick from the 12 days of incubation till 14 days after hatching. It increases during that time. The (I) content of the brain rises steadily, and reaches a maximum at 7 days after hatching. The chick becomes increasingly vigorous and alert during this time. (I) activity in skeletal muscle reaches a maximum at hatching when the first functional demands are made on this tissue; then it declines slightly to the adult level. Cardiac (I) reaches a maximum at 16 days of incubation, declines at hatching, and then increases to the adult level. Anoxemia may be responsible for the decline of (I) at hatching. Liver (I) becomes sensitive to Ca

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activation at hatching. If Ca is not added, (I) activity remains nearly constar throughout the period; but when present, (I) activity rises sharply after hatchin. The method of Moog and Steinback (*C. A.*, **39**, 4942[2]) was used for (I) determinatio C. H. RICHARDSON (Chem. Abstr.).

Variations in Vitamin B_1 Content of the Brain in Experimental Hyperthyroidis Rossi, C. A., and Moruzzi, G. (Univ. Bologna, Italy). [*Boll. soc. ital. bi sper.*, **22**, 1146–8 (1946).]

Rabbits were made hyperthyroid by daily intramuscular injections of 100 γ/kgn of thyroxine. The vitamin B_1 titer of the brain (Rittsert determination) diminishe about 80 per cent. in 30 days. HELEN LEE GRUEHL (Chem. Abstr.).

Indophenol Oxidase of the Central Nervous System. VI. Action of Sodium Cyanid and Carbon Monoxide on the Indophenol Oxidase of the Nerves. Mitol Michele, Sgaramella, Vincenza and Marzano, Giuseppe (Univ. Bari, Italy [*Boll. soc. ital. biol. sper.*, **22**, 971–4 (1946); *cf. C. A.*, **41**, 2167*h*.]

NaCN was injected into various animal species in lethal doses; CO was inhale until it caused death. The nerves were excised immediately and indophen oxidase determined by the Mitolo photometric micro-method (*C. A.*, **40**, 5821[2]. NaCN notably inhibited the indophenol oxidase power of the nerves, but rarel entirely inhibited it. The toxic action of CO was much less intense, and in som nerve sections there was even an occasional increase in indophenol oxidase.

VII. Action of Convulsive Poisons on the Indophenol Oxidase of the Nerves. Mitol Michele, Scaramuzzi, Franca, and D'Alessandro, Angela. [*Ibid.*, 974–7.]

Lethal doses of strychnine or quinine or convulsive doses of caffeine, codein dionine or heroin were injected into various animals and birds. In general th convulsive drugs increased the indophenol oxidase in the nerves, but this effec varied with the different animal species. In the rabbit there was generally a diminution.

IX. Action of some Reduction Oxidation Indicators and Eosin on the Indophen Oxidase of the Nerves. Mitolo, Michele, Borgia, Carlo E., and Salern Michelina. [*Ibid.*, 1066–9.]

Guinea-pigs were injected with small innocuous doses of 2, 6-dichlorophenol indophenol, thionine, the chloride of brilliant cresyl blue, methylene blue, or eosin Various portions of the nerves were excised 30 minutes after injection. Methylen blue, thionine, and 2, 6-dichlorophenolindophenol inhibited the indophenol oxidas activity of the nerves, while brilliant cresyl blue increased it, and protected th animal from NaCN intoxication. Small doses of eosin diminished the indophen oxidase activity. HELEN LEE GRUEHL (Chem. Abstr.).

Nicotinic Acid, Tryptophan and Pellagra. Biological Research and New Problem of Human Physiology. Chiancone, F. M. (Lab. Recerche Lepetit S. A. Milan). [*Vitaminologica (Milan)*, 1946, 97–9; *cf. C. A.*, **39**, 3339[1].]

There is discussed the role of nicotinic acid in human pellagra, black tongue o dogs, and fowl dermatosis, and its synthesis from tryptophan in rats, but not i man. Rats deprived of pyridoxine eliminated xanthurenic acid (4, 8-dihydroxy quinoline-2-carboxylic acid) in the urine, but not quinurenic acid (*cf.* Axelrod Morgan and Lepkovsky, *C. A.*, **40**, 626[5]). Rats were fed an excess of nicotinamid and an indication was found of increased elimination of xanthurenic acid. E. L. GREEN (Chem. Abstr.).

Sympathicomimetic Substances Extracted from Nerves and Tissues of Mammals Bacq, Z. M., and Fischer, P. (Univ. Liege, Belg.). [*Arch. intern. physiol.* **55**, 73–91 (1947).]

By comparison of the simultaneous contractions of the nictitating membran and uterus of the non-pregnant anesthetized cat it was possible to indicate tha extracts of the spleen of ox, cow, calf, horse and dog contained only arterenol

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extracts of coronary nerves of human coronary arteries contained only adrenaline, while extracts of splenic nerves and sympathetic system of horse and calf contained both substances. H. L. WILLIAMS (Chem. Abstr.).

The Neuro-regenerative Growth Substance "NR." (III). Koechlin, B., and Muralt, A. von (Univ. Bern, Switz.). [*Helv. Chim. Acta*, **30**, 519–24 (1947) (*in German*); *cf. C. A.*, **40**, 1571⁷.]

The " NR " substance (I) previously described is a non-proteinaceous, H_2O-soluble dialyzable compound of low molecular weight found in brain. Active extracts can also be prepared from peripheral nerves and the spinal cord. The (I) is found chiefly in the white matter of the brain, while the grey matter is only slightly active. Brain (with cerebellum and medulla) from a freshly slaughtered animal is stripped of the pia mater and coarsest blood vessels, and ground at 4° in isotonic salt solution. The cells must be well disintegrated. Dialysis of the mixture gives a clear yellowish dialyzate containing most of the activity. An optimum dilution of the dialyzate can be found, above and below where activity is decreased. This is attributed to the possible presence of an " NR " inhibitor. As a 1 c.c. injection of active material corresponds to only 1 mgm. of moist brain tissue, " NR " is present and effective in very small amounts.

IVAN A. WOLFF (Chem. Abstr.).

The Excitation by Succinic Acid of the Respiratory Center of the Dog in Apnea of hyperventilation. Bovet, Daniel, Monod, Jacques, and Lwoff, Andre. [*Compt. rend.*, **224**, 1844–6 (1947).]

Injection of 5–200 mgm. $NaHCO_3$ per kgm. into the saphenous vein or the carotid of the anesthetized dog in apnea from hyperventilation restored the action of the respiratory center as indicated by movements of the diaphragm. HCl had a similar action due to mobilization of alkali reserves. Injection of sodium succinate (I) gave the same results as $NaHCO_3$. In some dogs the injection into the saphenous vein of 5 mgm. (I) per kgm. restored movements of the diaphragm in 5–6 seconds, while others required 20–50 mgm. per kgm. The latent period was shorter when (I) was injected into the carotid. Certain animals did not react to either $NaHCO_3$ or (I). After the injection of glucose or EtOH (I) was ineffective, but Na salts of *l*-malic, fumaric and aspartic acids showed action. Na acetate, propionate and butyrate were inactive except in one instance when the butyrate showed weak activity. In the absence of CO_2 the nerve cell is deprived of diacids and other products essential to its metabolism. The fact that $NaHCO_3$ and (I) are inactive in some cases show that the effects of CO_2 deficiency are complex.

M. O. A. (Chem. Abstr.).

Action of Phenylisopropylamine on Neuromuscular Excitability. Boriani, A. (Univ. Bologna, Italy). [*Boll. soc. ital. biol. sper.*, **23**, 11–13 (1947).]

Phenylisopropylamine acting *in situ* on the gastrocnemius muscle and sciatic nerve of *Rana esculenta* greatly diminished the excitability of each.

HELEN LEE GRUEHL (Chem. Abstr.).

2. Pharmacology and Treatment.

Comparative Central-depressant Actions of some Ring-substituted Phenobarbitals. Alles, Gordon A., Ellis, Charles H., Feigen, George A., and Redemann, Mildred A. [*Univ. Calif. (Berkeley) Pubs. Pharmacol.*, **2**, 173–81 (1946); *cf. C. A.*, **41**, 4573*f*.]

In a group of ring alkyl-substituted derivatives (m-Me, p-Me, p-Et, p-iso-Pr, p-tert-Bu, p-OMe, 3, 4-O_2CH_2) of phenobarbital, the hypnotic effect always was less than that of phenobarbital itself; this was especially true of the p-OMe and the 3, 4-O_2CH_2 derivatives. Only the Me derivatives were comparable to phenobarbital in therapeutic index. In anticonvulsant action all the derivatives were inferior to phenobarbital, and exerted such action markedly only in hypnotic or lethal doses. JOSEPH S. HEPBURN (Chem. Abstr.).

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Conditions of Mechanical Sensitivity of the Carotid Sinus under Barbiturate Anesthesia. Panashchenko, A. D. [*J. Physiol. (U.S.S.R.)*, **32**, 287–91 (1946) (*in Russian*).]

Hexenal and sonbutal were used in rabbits and cats. Control experiments on non-anesthetized animals showed that mechanical stimulation produced a fall in the blood pressure with no marked changes in respiration. A much stronger effect on the blood pressure was produced under conditions where the sensitivity of the medullary centers and the receptors was changed by compressing the common carotid arteries. In this case the respiratory changes were variable. Similar experiments with both sonbutal and ether produced, in complete anesthesia, a drop in the blood pressure, and in incomplete anesthesia, no change in the blood pressure. In both kinds of narcosis respiration changes were variable. Hexenal anesthesia, whether complete or incomplete, failed to produce any blood-pressure changes indicative of a change in sensitivity of the pressure-sensitive receptors of the carotid sinus. Respiration was usually found to be inhibited.

S. Gottlieb (Chem. Abstr.).

The Carbohydrate Metabolism during Prolonged Pentothal Anesthesia in Dogs. I. The Blood Sugar and the Liver Glycogen. Booker, Walter M. (*Howard Univ. School of Med., Washington, D.C.*). [*Anesthesiology*, **7**, 405–15 (1946).]

The changes in blood sugar and in liver glycogen in dogs under prolonged pentothal (I) anesthesia are described. Evidence is presented tending to show interruption of the normal glycogenic-glycogenolytic activity of the liver under prolonged anesthesia. It appears that livers of animals deprived of food do not polymerize glucose under prolonged (I) anesthesia, and that prolonged anesthesia with (I) seems to decrease markedly the liver glycogen. The liver-function tests indicate that the liver is severely taxed during prolonged (I) anesthesia which may affect the normal functioning of the carbohydrate enzyme system at the site of the liver. The experiments raise the question as to the effectiveness of glucose administrations during prolonged (I) anesthesia to protect the liver, since excess glucose is not converted into glycogen during prolonged (I) anesthesia in animals on a normal diet, and since there is a breakdown of the stored liver glycogen in animals on a normal and on a high-carbohydrate diet.

Ruth Berggren (Chem. Abstr.).

Influence of Sex and Age in Acute Barbiturism. Donatelli, L. (*Univ. Firenze, Italy*). [*Boll. soc. ital. biol. per.*, **22**, 853–4 (1946).]

On the basis of clinical studies and tests on guinea-pigs, rabbits and mice, it was concluded that there was great individual variation in susceptibility to barbiturate intoxication within a species and even in the same individual under various conditions. In general, females were less susceptible than males. Men over 50 were a great deal more susceptible than younger men.

Helen Lee Gruehl (Chem. Abstr.).

Age, Sex and Acute Barbiturate Intoxication. Donatelli, Leonardo (*Univ. Firenze, Italy*). [*Arch. Intern. Pharmacodynamie*, **74**, 90–111 (1947); *cf. C. A.*, **41**, 3212*h*.]

On the basis of analysis of 160 human cases of barbiturate poisoning (usually barbital), Donatelli concludes that women are more resistant to the drug than men, and that human beings above the age of 50 are more sensitive than are those from 20 to 49 years of age. The same sex difference is demonstrable experimentally in guinea-pigs and mice, but not in rabbits. The resistance of female guinea-pigs persists in pregnancy, and is accentuated in the puerperium and during lactation. Administration of testosterone or estrogenic preparations to male mice prolongs the duration of narcosis, but shortens the period when given to females. The effect of luteinizing hormone or castration is not clear.

Wm. M. Govier (Chem. Abstr.).

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A Comparative Study on the Effect of Morphine and Chloral Hydrate on Respiration, with Special Consideration to Effecting Recovery of the Respiratory Center Injured by these Drugs by Means of Various Respiratory Analeptics. Matsumoto, Hiroshi. [*Acta Schol. Med. Univ. Imp. Kioto*, **25**, 19–44 (1943).]

From studies in rabbits of the analeptic effect of intravenous injection of camphor, cornidine, caffeine, lobeline, atropine, strychnine, picrotoxin, NH_3, EtOH, and adrenaline on morphine and chloral hydrate narcosis, it is concluded that chloral hydrate paralyses the respiratory center, while morphine produces a block action. J. G. YOSHIOKA (Chem. Abstr.).

Toxicity and Hypnotic and Antiepileptic Potency of Acetophenone. Comparative Study of Thienyl Ketones. Quevauviller, Andre (*Fac. pharm., Paris*). [*Ann. pharm. franç.*, **5**, 16–20 (1947); *cf. C. A.*, **41**, 3868*e*.]

A comparative study of the pharmacological properties of acetophenone (I), methyl methylthienyl ketone (II), methyl dimethylthienyl ketone (III), and of a mixture of unidentified ketones (IV) (probably ethyl propylthienyl ketones). Toxicity tests gave the following results (doses in gm. per kgm. body weight): maximum tolerated dose (mice), (I) 0·70, (II) 0·10, (III) 0·10, (IV) 0.20; MLD_{100} 1·60, 0·30, 0·40, 0·50; MLD^{50} 1·07, 0·23, 0·26, 0·34 respectively. Replacement of the Ph group of (I) by thienyl groupings increases the toxicity, destroys the hypnotic properties, and produces a depressive action on the respiratory center. At 50 per cent. of the MLD_{50} (I) has a definite antiepileptic action, while (II), (III) and (IV) have only a slight action which, at such subtoxic dose, cannot surely be considered as pure anticonvulsive. A. PAPINEAU-COUTURE (Chem. Abstr.).

Studies on the Influence of Active Reaction Media on the Action of Narcotics. Lebedeva, N. Ya (*Stalingrad Med. Inst.*). [*Farmakol. i Toksikol.*, **9**, *No.* 6, 10–12 (1946).]

In search of causes for intensification by acidity and weakening by alkalinity effects of 8 narcotics were tested on isolated frog heart, perfused with Ringer solution buffered with $NaHCO_3$ to 3 pH levels (6·4, 7·0 and 7·8). The tests reveal two groups of narcotics: $CHCl_3$, narcolan, Et_2O, trional and urethan showed no sensitivity to pH. Barbital, phenobarbital and amytal were quite sensitive to pH, reaching maximum activity on the acid side. Thus, phenobarbital (1 : 6,000) decreased cardiac amplitude 83, 46 and 7 per cent. at pH 6·4, 7·0 and 7·8; the corresponding figures at 1 : 3,000 were 100, 66 and 19 per cent. Sensitivity to pH, shown by barbiturates but not by other narcotics, is attributed to keto-enol tautomerism. These tests confirm the soundness of alkali therapy in barbiturate poisoning.
JULIAN F. SMITH (Chem. Abstr.).

Jacob's Ladder (*Polemonium caeruleum*) *as a Sedative. Tsofina, G. A.* [*Farmakol. i. Toksikol.*, **9**, *No.* 6, 45–6 (1946).]

Extracts of Jacob's ladder (I) were given to mice in three series: (1) 0·25–0·75 ml. of 4 per cent. extract; (2) same dose after giving 1 mgm. phenamine (II) in solution, or 0·2 ml. 10 per cent. camphor solution in oil; (3) 0·75 ml. 4 per cent. extract of (I), and 1 mgm. (II) 60 minutes later. The sedative effect was pronounced in each series, with substantial duration, and intensity of results were variable, but favorable enough to warrant further study. Pharmacodynamic properties and mechanism of action also merit attention. The evidence indicates that effects of (I) are only partly attributable to saponins.
JULIAN F. SMITH (Chem. Abstr.).

Comparative Influence of Analeptics on Some Functions of the Central Nervous System. II. Effects of Analeptics after Bleeding. Arbuzov, S. Ya. [*Farmakol. i Toksikol.*, **9**, *No.* 6, 3–9 (1946); *cf. C. A.*, **40**, 6172[2].]

Effects of corazole (I), cardiamine (II), and strychnine (III) on reflex time, respiration, and blood pressure were tested with rabbits before arteriotomy. The action of (I), (II) and (III) was intensified by arteriotomy; the minimum effective, spasmodic and lethal doses were lessened, while sensitivity of nerve centers to analeptics was sharply increased. To prevent toxic action, especially by ana-

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leptics having spasmodic effects in small doses, a liquid blood substitute should precede the analeptic. The minimum doses (in gm./kgm.) for affecting the latent reflex period before and after arteriotomy were, respectively: (I) 0·005 and 0·0025 (II) 0·01 and 0·005; (III) 0·0001 and 0·0001, given intravenously in each case.
JULIAN F. SMITH (Chem. Abstr.).

Effect of Insulin Hypoglycemia on Brain Glucose, Glycogen, Lactate, and Phosphates *Olsen, Norman S., and Klein, J. Raymond* (*Univ. of Illinois, Chicago*). [*Arch. Biochem.*, **13**, 343–7 (1947).]

The intramuscular administration of insulin to paralysed cats (5 units/kgm. body weight) resulted in most instances in a decrease in brain (whole brain frozen with liquid air) lactate, pyruvate, glucose, phosphocreatine, adenosinetriphosphate and acid-labile phosphate, and there was an increase in adenosine-diphosphate. Plasma lactate, pyruvate and glucose decreased. The most marked chemical changes occurred in the brain after the onset of coma. There was no marked relationship between the degree of chemical change in the brain and the duration and change in the electric activity. VERNON L. FRAMPTON (Chem. Abstr.).

The Present Status of Tryparsamide in Syphilotherapy. Koteen, Herbert (*Cornell Univ. Med. Coll., New York, N.Y.*). [*Am. J. Med. Sci.*, **213**, 611–20 (1947).]

A review including consideration of the pharmacology and toxicity of tryparsamide, which is considered a dangerous and inefficient drug.
FERRIN B. MORELAND (Chem. Abstr.).

Pharmacological Studies on Bulbocapnine. I. Extrapyramidal Catatonic Symptomatology in Chronic Experimental Toxicosis from Bulbocapnine. Ottaviano, Giuliano, and Pappalardo, Piero (*Univ. Catania, Sicily*). [*Boll. soc. ital. biol. sper.*, **22**, 1082–3 (1946).]

The daily injection of dogs with 30 mgm. bulbocapnine/kgm. for 40 days did not produce any noxious effects, but its continued use rendered the animals more sensitive to its action.

II. Blood Sugar after a Single Injection and During Prolonged Treatment with Bulbocapnine. [*Ibid.*, 1083–5.]

A single injection of 30 mgm./kgm. body weight in dogs caused a marked increase in blood sugar, which reached a maximum after 30 minutes. Daily injections of the same dose for 40 days caused a greater increase in blood sugar after injection, and increased the basic values after prolonged treatment.

III. Calcium and Potassium of the Blood Serum of Dogs during Prolonged Treatment with Bulbocapnine. [*Ibid.*, 1085–6.]

A single injection of 30 mgm./kgm. caused an increase in Ca and a diminution in K of the blood with maximum and minimum values, respectively 30 minutes after the injection. Determinations were made by the Kramer and Tisdall method (*C. A.*, **16**, 3688) after deproteinization of the serum with 10 per cent. trichloracetic acid. The same dose was injected daily, and tests were made every 10 days, 30 and 90 minutes after the injection. Similar results were obtained.

IV. Behavior of the Reticulo-endothelial System during Prolonged Treatment with Bulbocapnine. [*Ibid.*, 1087–8.]

Single or repeated injection of bulbocapnine had no effect on the function of the reticulo-endothelial system. HELEN LEE GRUEHL (Chem. Abstr.).

Effect of Cocaine on Reflex Activity of the Frog. Gerebtzoff, M. A. (*Univ. Brussels, Belg.*). [*Compt. rend. soc. biol.*, **140**, 791–2 (1946).]

In frogs subcutaneous injection of cocaine or local application to the brain increases reflex activity. The nervous center responsible is located in the diencephalon. L. E. GILSON (Chem. Abstr.).

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Antiadrenolytic Action of Atropine. Danielopolu, D., and Popa, Gr. Gr. (*1-ère Clin. Méd., Bucharest, Rumania*). [*Bull. acad. méd. Roumanie*, **18**, 171–3 (1946).]

By use of a previously reported method (*cf.* preceding abstr.), atropine is shown to have an antiadrenolytic action in addition to its antiacetylcholine action and its antihistaminolytic action. The second of these actions is stronger than the first. MARSHALL E. DEUTSCH (Chem. Abstr.).

Action of Thiamine Applied Directly to the Cerebral Cortex. Dias, M. Vianna (*Inst. Oswaldo Cruz, Rio de Janeiro*). [*Science*, **105**, 211–13 (1947).].

The application of thiamine-HCl solutions to the motor area of craniectomized unanesthetized dogs produced clonic contractions of corresponding muscles. Simultaneous cutaneous stimulation elicited generalized epileptiform convulsions. 2-Methyl-5-ethoxymethyl-6-aminopyridine, 4-methyl-5-β-hydroxy-ethylthiazole, pyridoxine, niacinamide, and ascorbic acid were ineffective.

KARL F. URBACH (Chem. Abstr.).

Influence of Ephedrine on Motor Chronaxia. Sandomirskii, M. I. (*Pavlov Inst. of Evolut. Physiol. and Pathol. of the Higher Nerv. Activity, Koltushi*). [*J. Physiol.* (*U.S.S.R.*), **32**, 511–14 (1946) (*in Russian*).]

Chronaximetric tests were carried out on 12 narcoleptics, 4 neurasthenics, and 6 normal individuals. In 18 of the 24 cases a considerable decrease in rheobase and an 18–66 per cent. shortening of the chronaxia was observed on administration of 50 mgm. ephedrine (I) orally. In 4 cases the administration of (I) led to a 28–45 per cent. increase in chronaxia ; in 3 of these the rheobase was slightly decreased. The shortening of chronaxia coincides with a certain increase of cortical excitability, as evidenced by euphoria following (I) administration. The data indicate that the effect of (I) sets in 15–20 minutes after its administration. The changes in chronaxia lasted 1·5–2·5 hours. H. A. WEGNER (Chem. Abstr.).

Reversal of Pharmacological Action on the Autonomic Nervous System by Doubling the Molecule. Buchel, Leya, Kohler, Denyse, and Levy, Jeanne. [*Compt. rend.*, **224**, 299–301 (1947).]

When injected, 2-p-toloxyethylamine has a vasoconstrictor and hypertensive effect. The double molecule, 2,2′-di-p-toloxy-diethylamine, when injected, has a vasodilating and hypotensive effect. W. M. McC. (Chem. Abstr.).

Action of Calcium Administered Intravenously and into the Cerebral Ventricles. Amiragova, M. G. (*Ihst. Physiol., Acad. Sci., Moscow*). [*Byull. Eksptl. Biol. Med.*, **22**, *No.* 9, 47–50 (1946).]

Intravenous injection of Ca into dogs simultaneously with intraventricular injection causes the same effect as injection into the brain only.

H. A. WEGNER (Chem. Abstr.).

Pharmacological Properties of Iodinated Choline and Brominated Choline. Cullumbine, H., and McDonald, F. F. [*Quart. J. Pharm. Pharmacol.*, **20**, 81–3 (1947).]

The Br compound is 2–5 times as active as the (I) compound. Both compounds behave qualitatively like the other choline compounds, but, on the blood pressure at least, the range between the dose required to produce a muscarine-like effect and that required to produce a nicotine-like effect is small. Pressor doses also depress the respiration. S. W. GOLDSTEIN (Chem. Abstr.).

Effect of Analeptic and other Substances on Paralyzing Action of Myanesin. Berger, F. M. [*Quart. J. Pharm. Pharmacol.*, **20**, 94–9 (1947).]

The effects of adrenaline, amphetamine, atropine, ephedrine, leptazol, nikethamide, physostigmine, picrotoxin, prostigmine and strychnine on the duration of myanesin paralysis has been investigated in mice. None of the substances had any appreciable effect on the duration of paralysis. The administration of a lethal

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dose of strychnine or leptazol to animals paralysed with myanesin prevented the occurrence of convulsions and deaths in the case of strychnine and of death only in the case of leptazol. The duration of paralysis in rabbits was shortened if strychnine was given intravenously immediately after myanesin was administered. The results of these experiments indicate that myanesin causes paralysis by a mechanism different from that of narcotics, anesthetics, and curare-like agents and offer further evidence to show that myanesin has a selective depressant action on the spinal cord. S. W. GOLDSTEIN (Chem. Abstr.).

Spinal-fluid Findings in Spinal Anesthesia. Black, M. Gene (*Massachusetts Mem. Hosp., Boston*). [*Anesthesiology*, **8**, 382–9 (1947).].

The spinal fluids of 200 patients were studied to determine the effect of spinal anesthesia. In 75 control cases the spinal fluids were within normal limits. In 60 cases in which the fluid was taken 30 days to 10 years after spinal anesthesia there was, in comparison, a mild increase in protein, chiefly because the interval was less than 3 months in 20 cases. In 40 cases in which the spinal fluid was taken 1–30 days after spinal anesthesia there was a significant rise in protein, tending to indicate that a mild but transient irritation occurs after spinal anesthesia. In 25 cases specimens of spinal fluid obtained before and after continuous spinal anesthesia were examined. Protein variations were negligible, which suggests that the time interval was inadequate for meningeal or tissue irritation to be demonstrated. Spinal-fluid sugar contents in this group presented a marked rise at the end of operation when patients were kept in a horizontal position. This rise may be caused by pooling of the glucose at the site of injection. The Trendelenburg position promotes diffusion; this diffused glucose may promote central-nervous-system metabolism. It is suggested that pontocaine or any similar anesthetic agent used intraspinally may produce transient irritation, the possible exception being the rare individual allergic to the drug. Glucose, when used in conjunction with spinal anesthetic agents and if permitted to diffuse by use of the Trendelenburg position, may be helpful rather than harmful to the tissue of the central nervous system. RUTH BERGGREN (Chem. Abstr.).

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Part I.—Original Articles.

POST-HYPOGLYCAEMIC ENCEPHALOPATHY IN SAKEL'S INSULIN TREATMENT.

By A. M. SPENCER, M.B., B.Sc., D.P.M.,

Deputy Medical Superintendent, Joint Counties Mental Hospital, Carmarthen.

INTRODUCED in 1933, Sakel's pharmacological shock treatment [Sakel (1935*a*, 1935*b*, 1938)] is now regarded as a valuable method of treatment in schizophrenia. The complications which may ensue during the treatment are, however, both numerous and dangerous, and may be classified according to the system predominantly affected as follows:

(1) The Respiratory System.
(2) The Cardiovascular System.
(3) The Nervous System.

Complications of the respiratory and cardiovascular systems are comparatively rare, acute pulmonary oedema being the most serious complication affecting the respiratory system, while acute myocardial failure is a rare fatal complication of the cardiovascular system. Complications of the nervous system, on the other hand, are frequent and, ranging as they do from mild conditions such as transitory aphasia to fatal prolonged coma, constitute the major hazards of the treatment.

A. NEUROLOGICAL COMPLICATIONS OF SAKEL'S TREATMENT.

While the condition known as prolonged coma is the commonest and most fully reported complication, a large number of other complications occur which indicate that damage to the central nervous system may vary from the slightest degree to the most profound. These complications may be classified according to the main presenting symptoms as follows:

(1) *Confusion.*—Slight degrees of confusion persisting for a few hours after interruption of the coma are common in practice and references to the condition are fairly frequent, e.g. Gillman and Parfitt (1938), Katzenelbogen *et al.* (1939), Coyne (1940), Kant (1940). Gillman and Parfitt (1938) mention

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that "we have given intravenous sugar more than 300 times to patients who were not sufficiently conscious 30 minutes after the feed, usually with satisfactory results, but fairly frequently a certain amount of confusion, mild headache and malaise persists." These authors' comment on such cases is especially noteworthy—"great care should be ensured in such cases when deciding the duration of the next shock, for we believe such conditions are often forerunners of delayed recovery of a serious kind."

(2) *Stupor.*—This may be present either alone or with one or more of the neurological abnormalities described below. In cases of the former type, the patient may be able to obey simple passive commands and the swallowing reflex is present. In practice, patients are frequently stuporose for short periods after the hypoglycaemia has been terminated, but Scherb and Stone (1938) mention a case in which the patient was stuporose for 8 hours, while a patient of Kant (1940) was "in a deeply clouded, stuporose condition" for 10 hours.

(3) *Aphasia.*—A number of cases have been reported in which aphasia occurred, usually of a transient character and clearing up after a few hours. Sometimes the aphasia occurs alone [Ruslander (1937–38), Goldman (1940), Golden (1937)] but it is usually accompanied by other abnormal nervous signs and symptoms. Schatner and O'Neill (1938) report the occurrence in a male patient of a paralysis of the right arm, which disappeared in 20 minutes, being accompanied by a motor aphasia which persisted for about an hour, while a female patient developed paralysis of the right arm and right leg, persisting for 3 hours and accompanied by a motor and sensory aphasia which cleared up in 1½ hours. Scherb and Stone (1938) record a case which had a transient aphasia accompanied by a severe headache, while Wortis, Bowman *et al.* (1937) noted three instances of transitory aphasia associated with facial weakness. A right hemiplegia and aphasia persisting for 10 hours in a patient aged 58 years is mentioned by Bond, Hughes and Flaherty (1939). Kant (1940) records that in a case of motor and sensory aphasia occurring on the 52nd day of treatment, the sensory features of the aphasia disappeared before the motor ones.

(4) *Dysarthria.*—A mild transient degree of dysarthria is frequently found in patients recovering from coma which has been interrupted by stomach tube, but Horwitz, Blalock and Harris (1938) record a case of an 8-year-old boy who was still stuporose 10 hours after intravenous injection of glucose. At 11 hours he was able to say Mama, but otherwise his speech was dysarthric.

(5) *Echolalia and Echopraxia.*—Horwitz, Blalock and Harris (1938) mention a case of post-hypoglycaemic stupor in which "as his physical condition improved and his speech returned, marked echolalia and echopraxia were observed."

(6) *Rotary movements.*—Read, Heilbrunn and Liebert (1939) record a case in which "we observed some peculiar rotary movements setting in 1 hour after interruption of shock. These movements lasted about 2 hours, and could be started in either direction by a slight push to the shoulder."

(7) *Diplopia.*—Schatner and O'Neill (1938) record three instances of diplopia in two female patients, who complained of double vision after interruption of hypoglycaemia and disappearing after about 20 minutes.

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(8) *Facial paralysis.*—In addition to the facial paralysis occurring as part of a hemiplegia, Binzley and Anderson (1938) mention a case in which marked motor activity occurred during administration of glucose by vein, there being a shifting Babinski response and a paralysis of the right facial muscles.

(9) *Hemiplegias.*—Several instances of this complication are reported in addition to those mentioned under (3) above. The condition is usually transitory, clearing up after a few hours [Wortis, Bowman *et al.* (1937), Young *et al.* (1937), Golden (1937), Horwitz, Blalock and Harris (1938), Binzley and Anderson (1938), Bond, Hughes and Flaherty (1939), Schatner and O'Neill (1938)]. Read, Heilbrunn and Liebert (1939) cite a case in which a female patient developed a permanent left Hoffman sign, slight left facial palsy and increased reflexes. Palisa (1938) found among 170 cases, 6 patients who developed a right-sided hemiplegia, 1 with a left-sided hemiplegia, and 1 patient who showed an alternating right and left hemiplegia on no fewer than 5 occasions during a course of 55 shocks. The higher incidence of right-sided hemiplegias may be due to the greater development of the left cerebral hemisphere in right-handed people, rendering it more vulnerable to the adverse effects of insulin.

(10) *Epileptiform seizures.*—The term "convulsion" appears to be used loosely in the literature to cover both the generalized myotonic spasms, which may last up to 10 minutes, and the typical epileptiform seizure similar to that seen in idiopathic epilepsy. Read, Heilbrunn and Liebert (1939) state that 34 patients developed a convulsion at some time during the treatment. Three of these developed epileptic states, the first immediately, the second within 4 hours, and the third 15 hours after interruption of shock, but no details are given as to the exact nature of the convulsions, or whether they occurred while the patient was mentally clear or still in post-hypoglycaemic stupor. Similar accounts of convulsions are given by Scherb and Stone (1938), Young *et al.* (1937), Katzenelbogen (1939), Morrow (1938), Katzenelbogen *et al.* (1939), Kant (1940), Gillies (1937) and Gillman and Parfitt (1938), but in all these cases even where an epileptic fit is mentioned specifically it is difficult to be sure that intense generalized tonic spasms are not referred to. Typical major epileptiform seizures certainly occur, usually during the *early* stages of shock, sometimes before the patient has become unconscious, the effect frequently being that the unconscious patient spontaneously awakes owing to the rise in blood sugar following the seizure, but it is very difficult to see how such a seizure can occur in the absence of symptoms once the hypoglycaemia has been effectively interrupted, unless the patient develops "after shock" with its consequent fall in the blood sugar. Gillman and Parfitt (1938), however, report the case of a female patient who had a series of 15 fits at 10-minute intervals approximately 26 hours after interruption, during which time "she remained well."

The remaining complication of the nervous system is post-hypoglycaemic coma. It appears that the nervous complications cannot be divided into definite categories, but that they shade gradually from the mildest degree of mental clouding, through severe degrees, of such clouding, transient aphasias and paralyses, epileptiform convulsions and so on to the fully developed

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post-hypoglycaemic coma, which, it will be seen, can itself be of varying degrees of severity, lasting from a few hours to several days. We turn now to a consideration of this condition.

B. POST-HYPOGLYCAEMIC COMA.

I. Synonyms.

Prolonged coma ; non-hypoglycaemic coma ; protracted shock.

II. Definition.

Post-hypoglycaemic coma [Goldman (1940)] occurs when the patient does not recover consciousness after sufficient glucose has been given either orally or intravenously ordinarily to terminate the coma. The condition is marked by varying degrees of hyperthermia ; hyperventilation, both hyper- and tachypnoea ; motor excitement, rigidity and tonic-spasms ; the Babinski response may or may not be present, but the corneal reflex can usually be elicited. The condition may persist for from a few hours to several days, and may result in (*a*) complete recovery, (*b*) recovery with varying degrees of cerebral damage, or (*c*) death (*Brit. Med. J.*, 1940).

III. Reported Cases.

De Morsier and Mozer (1936) first described the condition of post-hypoglycaemic coma in a morphine addict who was being treated with insulin. The first case occurring in Sakel's treatment was reported in the following year by Salm (1937). Following this a large number of reports have appeared. The following list is comprehensive except for articles in a few foreign journals which were not available for this study : Franke (1937), Gillies (1937), Kobler (1938), Leppien and Peters (1937), Molony and Honan (1937), Rossman and Cline (1937–38), Sherril and McKay (1937), Wortis, Bowman *et al.* (1937), Baker (1938), Binzley and Anderson (1938), Cammermeyer (1938), Doring (1938), Easton (1938), Finiefs (1938*a*), Gillman and Parfitt (1938), Horwitz *et al.* (1938), James, Freudenberg and Cannon (1938), Kastein (1938*a*, 1938*b*, 1938*c*), Lazell (1938), Lester (1938–39), Morrow (1938), Milch and Bolles (1938), McKendree (1938), Plattner (1938), O'Neill (1938), Scherb and Stone (1938), Telatin (1938), Timmer (1938), Baker (1939), Baganz and Laxon (1938), Braestrup (1939), Freed and Saxe (1939), Katzenelbogen (1939), MacKeith and Meyer (1939), Murphy (1939), Ribeiro and di Lascio (1939), Skaug and Hellem (1939), Theato (1939), Wortis and Lambert (1939), Yahn and da Silva (1939), Coyne (1940), Goldman (1940), Jansen and Waaler (1940), Kant (1940), Klein and Ligterink (1940), Vie and Opolon (1940), Polatin, Strauss and Altman (1940), Robinson and Robinson (1940), Abely and Feuillet (1941), Cleckley and Templeton (1941), Gralnick (1941), Abely and Feuillet (1942), Lawrence, Meyer and Nevin (1942), Proctor and Easton (1942), Schou (1942), Rivers and Rome (1944), Wechsler (1944).

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IV. Modifications of Sakel's Hypoglycaemic Treatment.

It has been generally assumed that prolonged coma is caused by the induction of coma of such *depth* that irreversible changes have occurred in the brain. Unfortunately, the whole question of coma is confused in the literature owing to the differing standards of coma adopted by various authors and the frequent absence in published papers of the standard adopted by the writers. The present writer (Spencer, 1947) has reviewed the question, showing that Sakel himself used the term to cover all stages of unconsciousness from "sopor" (von Angyal, 1937) to unconsciousness and complete areflexia. The position would have been clarified considerably if a common standard of coma such as that adopted by Wilson (1937) of unconsciousness with Babinski responses and absent corneal reflexes had been generally agreed upon. Insufficient attention has also been paid to the influence of the *time* for which patients have been allowed to remain in coma, and the question has not been investigated as to whether prolonged coma is more likely to follow a deep coma lasting for a short time or a light coma induced for a longer period.

Owing to the dangers inherent in coma of Wilson's standard, medical and nursing staff shortages, etc., there has been a tendency in recent years for only the lighter types of unconsciousness to be induced, [e.g. Sherman, Mergener and Low (1941), Sandison and McGregor (1942)], although the duration of the hypoglycaemia remains about 5 hours. Early in 1945 a modified form of insulin therapy was instituted at the Joint Counties Mental Hospital, Carmarthen, as shortage of staff did not permit the practice of "deep-coma" therapy, and as events proved, this modified therapy cast considerable light upon the importance of the *duration* of unconsciousness in the production of prolonged coma.

Under this modified form of insulin treatment, the patients were given just sufficient insulin to induce unconsciousness after the lapse of some 3–4 hours from the time of the injection. This corresponds to the state called "sopor" by some authors. Frequently, but not invariably, the plantar responses become extensor during the period of unconsciousness, but the corneal reflexes are always briskly present. It will thus be seen that the depth of the coma is very light, and in no way comparable with the deep coma normally induced, in which the plantar responses are always extensor and the corneal reflexes either very sluggish or completely abolished. It was found, however, that once the "sopor" dose of insulin had been attained, the addition of a further 5 units was usually sufficient to extend the length of "sopor" to periods of from 1–4 hours, after which the patient spontaneously awoke. A total of 8 or 9 hours' hypoglycaemia might thus be induced, including 1–5 hours of light unconsciousness. *Duration of "sopor" replaced depth of coma as the object of the treatment.* Profuse perspiration might occur, but the sopor is never deep enough for tonic muscular spasms to be produced. Patients usually require about 30–40 units to produce sopors of 2–4 hours, but in the 50 patients to whom the treatment has been given, only 3 have required more than 50 units, there being one case requiring 70 units. It will thus be seen that the modified treatment is altogether lighter than Sakel's treatment.

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It is no alternative to the latter treatment, and was only instituted because shortage of nursing and medical staff did not permit the giving of Sakel's treatment, and following the good results achieved by some workers with ambulatory insulin treatment [Polatin and Spotnitz (1942 and 1943).] While the results of the treatment do not compare with those obtained by Sakel, they are good enough to warrant its continuation until it can be replaced by the more thorough-going technique.

Despite the very light state of unconsciousness induced in this modified treatment, two of the first 30 patients treated developed prolonged comas, one of which terminated fatally. Case-reports of the two instances of prolonged comas will now be given, as they illustrate several features not mentioned previously in the literature.

V. Case Reports.

Case 1.—Female, aged 54 years.

Diagnosis.—Involutional melancholia.

The patient's illness dated from January, 1938. On 28.vi.38 she was admitted to the Maudsley Hospital. She showed the usual characteristics of involutional melancholia, intense depression, morbid feelings of guilt and unworthiness with somatic delusions, such as that she was suffering from venereal disease, and that consequently her bowels were stopped up. Prior to admission she had attempted suicide. She became more depressed during the following year, and was transferred to the City of London Mental Hospital on 29.vi.39. She remained unimproved, and was discharged to her husband's care on 7.x.39. A feature was noted at this time which became more marked later on. This was the conscious wish of the patient not to recover. She refused to co-operate in her treatment because she wished to die and not get well.

On 11.iii.41 she was admitted to the Joint Counties Mental Hospital, Carmarthen, her condition being as outlined above. Strong death wishes were prominent, and she stated that she could not and did not wish to recover. Electrical convulsive therapy was tried without effect. When the modified insulin treatment was instituted in the Hospital early in 1945, the patient was started on a course of treatment despite the length of her illness. On 12.iii.45 she was given an initial dose of 10 units. This was increased by 5 units each day, until she went into sopor 4½ hours after the injection of 35 units. During the following weeks the dose varied between 20–30 units, sopor usually lasting about 3–4 hours. She always awoke spontaneously, and at no time did her condition give rise to any anxiety. Her mental state gradually began to improve, inasmuch as her depression became less profound, but throughout she constantly expressed her wish to die and not to get better. Treatment was continued for 4 months and unexpectedly terminated as follows:

6.vi.45: Dose of insulin—20 units—sopor 4 hours. Spontaneous awakening. Took tea and supper and appeared her usual self.

7.vi.45: Dose of insulin—25 units—sopor 6 hours. She came round spontaneously, sufficiently to take a cup of tea, but was very confused, and almost immediately relapsed into a stuporose state in which she could be spoon-fed with fluids, but in which she was not conscious and was unable to speak. As this state showed signs of continuing, she was regarded as being in post-hypoglycaemic coma. Adequate fluids, intravenous glucose, sodium chloride, vitamins B and C were given in order to maintain her general condition, which was very good. Lumbar puncture was performed, but the fluid did not appear to be under increased pressure and its biochemical analysis gave normal results. Temperature 98·2° F., pulse 96, respirations 24.

8.vi.45: Her condition is unchanged except that at the end of the day her temperature has risen to 101·8° F. and her pulse, of good volume, is 118/minute. Respirations, 20/minute. Fluids have been continued and she takes well by spoon-feeding, being able to swallow easily. Her eyes are open, and one has the impression that she is just beyond being fully conscious. One feels that if she made

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the effort she could become fully conscious, but her attitude is one of complete apathy and she is incontinent of urine. She remains mute. Her condition is most interesting and unusual. It appears as though she is deliberately willing herself to remain out of contact with reality, a condition in keeping with her frequently expressed wish to die.

9.vi.45: Her condition remains unchanged. Treatment as before. General condition good. She continues to give the impression that she is deliberately refusing to regain full consciousness. She sits propped up in bed looking vacantly in front of her in a completely passive attitude. Temperature 102° F., pulse 110/minute, respirations 18/minute.

10.vi.45: During the day her general condition has deteriorated considerably. She remains just "around the corner" from full consciousness, but her physical condition is causing concern. She has been given continuous "drip" saline to maintain the circulation and has had a transfusion of one pint of blood. Late in the day she became cyanosed, but this was relieved by oxygen given through a nasal catheter. Temperature 103° F., pulse 120, respirations 24.

11.vi.45: Her heart failed finally at 1.0 a.m. Permission for a post-mortem examination was refused.

Comment on Case.

This case is interesting for two reasons:

(1) It proves conclusively that depth of coma is not necessarily the most important factor in the production of post-hypoglycaemic coma, but that the duration of hypoglycaemia may be of even greater importance. This patient's hypoglycaemic state was so light that she did not even develop extensor plantar responses, yet despite this, after a period of 6 hours' unconsciousness at the "sopor" stage she developed prolonged coma. The significance of this will be more fully discussed later.

(2) The psychological factor seemed to enter significantly into the outcome of the coma. This also will be discussed in detail later, but it may be said now that the patient's frequently expressed wish not merely to die (a passive wish), but her wish not to get better (an active wish), indicated such a powerful development of the Freudian death-instincts that she died when she need not have done so. In watching her attitude during her prolonged coma one was almost forced to the conclusion that the patient deliberately willed herself to death.

CASE 2.—Female, aged 24 years.

Diagnosis.—Paranoid schizophrenia.

This patient had been ill for 2 months before her admission to the Joint Counties Mental Hospital, Carmarthen, on 14.xii.45. Several near members of her family were below average in intelligence, but no cases of psychotic breakdown among them could be elicited. The patient had always been of a shy, introverted disposition, and no adequate external cause for her breakdown could be found.

Condition on admission.—During the interview her manner was pleasant and equable, but her answers to questions were frequently delayed owing to blockage of thought. Her level of general intelligence was definitely subnormal. She was unable to do the 100–7 test, she knew the number of pence in 1*s.* 9*d.*, but could not do the 3*d.*'s in 3*s.* 9*d.* and the 2*s.* 6*d.*'s in 15*s.* She had no knowledge of current affairs. She showed marked ideas of reference, and believed that people around her were constantly laughing at her. A number of non-systematized paranoid delusions were easily elicited. She believed that her parents were trying to rob her of some money which she had in the bank, and that her brother-in-law had tried to kill her with a pocket-knife on a number of occasions. She could give no reason for his wanting to do this except that he was against her.

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She believed that her food in the hospital was being poisoned, and that one of the nurses wanted to kill her as she was in league with her parents. She was aurally hallucinated for a man's voice which abused her, but she would not discuss her hallucinations in detail. In view of her persecution at home and her hallucinatory experiences she had decided to commit suicide as soon as possible. There was mild incongruity between her thought processes and mood. She completely lacked insight into her mental state and believed that she was perfectly well.

Her physical state was satisfactory except that she had a raised blood pressure (178/94).

During the following 2 weeks she received a course of 7 electrical convulsions, as a result of which she was considerably less restless, although her schizophrenic thought processes remained the same, nor did she develop any insight into her condition. In view of her poor response to E.C.T. a course of modified insulin therapy as given to the previous patient (Case 1) was started on 7.1.46.

Responses to insulin.—The initial dose of insulin was 20 units, increased on succeeding days as follows until she developed sopor: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70. On 70 units she went into sopor for the first time for the unexpectedly long period of 4½ hours, from which she spontaneously awoke. In view of the length of this sopor, the dose was reduced the following day to 60 units. The injection was given at 7.0 a.m. and she went into sopor at 11.10. The sopor was quite light, although Babinski responses were present from 11.30–12 noon. Her condition was perfectly satisfactory and sopor was allowed to continue for 5 hours, i.e. until 4.10 p.m., at which time she was given 100 c.c. of glucose (40 per cent.) intravenously. Her sopor lightened further following this, but she did not regain consciousness. Twenty minutes later she was given a further 100 c.c. of glucose (40 per cent.) intravenously without effect and she was then judged to be in post-hypoglycaemic coma.

Her condition at this time differed remarkably from that seen in most cases of post-hypoglycaemic coma. She appeared to be asleep. Respirations were regular, deep and of average rate. Her pulse was regular, of good volume, although a little fast (90/minute). She did not perspire, and all her reflexes were normal. At no time did she show tonic extensor spasms. *She remained in this condition for 5 days.* Her general condition remained satisfactory throughout this time and never gave rise to any anxiety. Her treatment consisted of generous quantities of milk, water, sodium chloride, halibut oil (for vitamins A and D) and marmite (vitamin B) by stomach tube; ascorbic acid and vitamin B parentally to ensure absorption. Her temperature rose to 99·6° F. on the first day, but became normal on the second day and did not rise again.

At the end of the fifth day of coma she spontaneously awoke. Her speech was slurred for the first few hours and then rapidly improved. By the following day she appeared to be her normal self apart from a slight degree of confusion which persisted for 3 days, when it cleared up.

Condition 7 Days After End of Prolonged Coma.

Her mental condition has improved considerably compared with what it has been on admission. Most noticeably, all her paranoid delusions and hallucinations have disappeared and *she is completely amnesic for ever having held them.* She is considerably more alert and active than on admission, and spontaneously takes part in the ward activities. She is, however, still entirely lacking in insight into her mental state and has no idea why she had to come to the hospital. She is also amnesic for the whole of the period of her prolonged coma.

She remained in this condition until her discharge from hospital 3 months later. A follow-up 4 months after her discharge indicated that her parents considered that she was better than she had been for a number of years, and that she was doing her work on a farm perfectly satisfactorily, although she was still rather shy and reserved.

Comment on Case.

Like the preceding case, this patient illustrates the view that great depth of coma is not necessary for the production of post-hypoglycaemic coma, but that the *duration* of hypoglycaemia is of equal importance. This patient had

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a period of 9 hours' hypoglycaemia, including 5 hours of sopor. Although the sopor was very "light," the hypoglycaemia was sufficiently long to produce irreversible changes in the brain which caused the post-hypoglycaemic coma, which was also of a superficial character.

VI. Aetiology of Post-Hypoglycaemic Coma.

(1) *Incidence of Post-Hypoglycaemic Coma.*

It is difficult to arrive at a satisfactory estimate of the incidence of the complication owing to the large number of unreported cases, and because the percentage incidence is frequently not given in those which are reported. In the present author's series of 146 cases the condition occurred 4 times (2·7 per cent.). Dussik (1936 and 1938) found it occurred 5 times in 5,000 treatments. In a survey of post-hypoglycaemic coma in 20 hospitals in U.S.A., Lester (1938–39) found a total of 25 examples among 1,173 completed insulin cases (2·1 per cent.). Kant (1940) had 9 cases in a series of 61 patients (15 per cent.); Goldman, 23 in a series of 108 patients (21·1 per cent.); Rivers and Rome (1944) 38 in a series of 225 patients (17·1 per cent.); while Schou (1942) found the high proportion of 127 out of 375 patients (30·1 per cent.). There seems to be no satisfactory explanation for these widely differing degrees of incidence.

(2) *Age and Sex of Patients.*

A review of the recorded cases indicates that the ages of the patients vary from 20–48 years, with the age group 20–30 years predominating. As the age of onset of schizophrenia is also chiefly in this age group, no significance would appear to attach to the age of the patient as far as liability to post-hypoglycaemic coma is concerned.

Among a sample of 96 cases in the literature, there were 52 males and 44 females, so that the sexes would appear to be equally subject to the condition.

(3) *Race and Climate.*

Post-hypoglycaemic coma has been reported from all countries where Sakel's treatment has been tried. In America, white and negro patients seem to be equally liable to the condition.

(4) *Type of Schizophrenia in Affected Patients.*

Catatonic, paranoid and hebephrenic types of schizophrenia are all reported, with the paranoid form predominating. The absence of cases of the dementia simplex type is probably due to the fact that these patients tend not to receive insulin treatment in view of the poor results obtained with such patients. Easton (1938) states that he had become increasingly wary of a certain type of patient, tall, asthenic, with cold, blue hands and feet, whom he had found to tolerate insulin very poorly. Lester (1938–39) believes that prolonged coma is due to the fact that a number of patients possess a constitution which is unable to withstand with average impunity a prolonged period of hypoglycaemia. No details are given, however, as to the type of constitution the author refers to.

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That the condition is not restricted to schizophrenia is shown by the present author's case, Case 1, who was an involutional melancholic, while Cleckley and Templeton (1941) had two patients, one with a manic-depressive psychosis and the other with hysteria, who developed post-hypoglycaemic coma.

(5) *Dose of Insulin at which Post-Hypoglycaemic Coma Occurs.*

Analysis of 83 published cases in which is given the dose on which prolonged coma occurred gives the figures of the following table:

TABLE I.

Units of insulin	20–39	40–59	60–79	80–99	100–119	120–139	140–159	160–179
Number of cases	2	12	11	16	10	10	6	4
Units of insulin	**180–199**	**200–219**	**220–239**	**240–259**	**260–279**	**280–299**	**300–324**	**325 +**
Number of cases	2	4	1	1	1	—	1	4

While there may be a slightly greater proportion of cases in the 80–99 units group, in general the range of doses corresponds closely to that used in uncomplicated cases, and undue sensitivity to insulin, requiring the use of smaller doses than usual, does not appear to be of aetiological significance in post-hypoglycaemic coma.

(6) *Number of Daily Treatments after which Post-Hypoglycaemic Coma Occurs.*

In order to ascertain whether prolonged coma is more likely to occur at any stage in the course of the treatment, the 55 cases in the literature which give the necessary information were analysed to find:

(*a*) The day of treatment on which the initial coma occurred.

(*b*) The number of cases preceding the prolonged coma.

(*c*) The total number of treatments preceding the prolonged coma.

The results of the analysis are set out in the following table. To ensure that the table is arithmetically complete, it is necessary to know, in addition to

TABLE II.

(A) = Day of treatment of initial coma.
(B) = Number of comas before prolonged coma.
(C) = Total number of treatments before prolonged coma.

Case Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
(A)	6	6	—	4	2	—	—	9	21	5	4	30	8	5	4	4	—	14	5
(B)	3	5	21	—	3	—	—	6	1	1	2	1	14	1	11	36	35	2	4
(C)	9	11	21	4	5	7	21	25	22	6	31	22	6	25	40	44	16	9	—

Case Number	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
(A)	—	—	—	9	13	10	6	8	10	13	12	6	14	6	12	5	2	—
(B)	30	16	7	6	12	25	4	9	3	5	23	1	—	28	5	9	7	—
(C)	—	24	20	27	25	35	10	17	13	18	35	7	28	34	17	14	9	55

Case Number	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
(A)	—	6	—	—	3	3	11	8	6	—	—	5	6	4	3	—	6	—
(B)	—	2	—	—	1	1	6	26	5	—	22	2	5	1	2	—	11	—
(C)	52	8	18	19	14	4	17	34	13	6	41	7	11	5	5	7	17	6

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he above factors, the number of non-coma treatments the patient received ıfter the initial coma, but this information is not given in several of the articles, ɔ that the table is not arithmetically complete.

These results are given in detail above as they show that in a certain proportion ɔf cases there is a definite association between the occurrence of prolonged ɔoma and the induction of coma after only a few days' treatment (Cases 1, 2, 4, 5, 10, 11, 14, 19, 26, 31, 36, 43, 47, 49, 51, 52, 53 and 55). The results may ılso be grouped as follows:

TABLE III.

Days	1–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40+
Number of patients whose *number of days of treatment before initial coma* fall into the opposite groups	11	19	9	—	1	—	1	—	—
Number of patients whose *number of comas preceding the prolonged coma* fall into the opposite groups	18	8	4	1	3	3	1	2	—
Number of patients whose *total number of treatments preceding the prolonged coma* fall into the opposite groups	3	16	6	11	5	3	3	2	5

This table brings out—

(1) That prolonged coma may occur at any time during the course of Sakel's treatment: 10 of 54 patients had received more than 30 treatment-days before their prolonged coma occurred, while 5 had actually received more than 40 daily treatments. Attention may be drawn particularly to these findings. While, as is seen below, the majority of cases of prolonged coma occur through coma being induced too rapidly in the course of treatment, yet a considerable proportion (20 per cent.) of patients go through more than 30 days' treatment normally and then suddenly develop prolonged coma. Constitutionally, they can hardly be different on the day they develop prolonged coma from what they were on the previous 30 days. By the 30th day of treatment the coma dose of insulin is usually standardized, and yet unexpectedly the patients develop post-hypoglycaemic coma. Rivers and Rome (1944) point out that in a large proportion of their 38 patients who developed prolonged coma deeper stupors had previously been observed, and yet the patients had not previously developed prolonged coma. It was the existence of this group of patients which led to the attempt to determine whether the probably shorter-acting intravenous insulin would give rise to fewer neurological complications than the usual subcutaneous or intramuscular insulin (Spencer, 1947).

(2) That, despite the above, the majority of cases of prolonged coma occur in the early days of the course of treatment and especially, as noted above, if coma is induced only a few days after the commencement of the treatment. Eleven of 41 patients had less than 5 treatments before coma was induced, and 30 of 41 patients had less than 10 treatments. In addition, of 40 patients, 18 had received fewer than 5 comas and 26 fewer than 10 comas when they went

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into prolonged coma. Of 41 patients, 3 had received less than 5 treatments in all and 19 less than 10 treatments in all before post-hypoglycaemic coma set in. Since prolonged coma can occur at any time during the course of treatment, other factors must obviously play a part, but the table shows the danger of increasing the dose of insulin so rapidly that coma is reached by the 5th or 10th day. Thirty-nine of 41 patients who developed prolonged coma had coma induced within 15 days of commencing the treatment, and it is probable that had coma been induced over a period of, say, 21 days, the incidence of prolonged coma would have been considerably less, since only 2 of the same 41 patients had had coma induced over periods of larger than 15 days. It is not merely a question of increasing the daily dose of insulin by equally small doses in all cases, as each patient's reaction to insulin is peculiar to that patient, but of determining the daily increase according to the development of the signs of hypoglycaemia in each patient so that coma will be reached by about the 21st day. Because of this, Lester's (1938–39) finding that a series of patients who developed prolonged coma after less than 4 comas had been given a daily increase of 12·5 units, whereas a similar series of patients who developed the condition on, as an average, the 20th coma had been given a daily increase of 10·6 units, is not significant.

VII. Pathology of Post-Hypoglycaemic Coma.

(1) Morbid Anatomy.

In the reports in the literature of post-mortem examinations of patients who have died from post-hypoglycaemic coma, attention has been devoted almost exclusively to the brain, from the pathology of which the various authors have attempted to deduce the cause of the condition. Microscopic studies of other organs have only been reported in a few cases, but as Dunner, Ostertag and Thanhauser (1933), Enstene and Altschule (1931), Ernstene *et al.* (1935), Jorgensen (1940), Tannenberg (1939) and Terron and Malesani (1939) have shown in animal experiments, the heart, skeletal muscles and the liver may also show marked changes, and the cause of prolonged coma may be found in dysfunction of some organ other than the brain, despite the primarily neurological clinical picture seen in the condition. The morbid anatomy may therefore be considered under the various systems and organs which are affected by hyperinsulinism in human subjects:

(*a*) The Central Nervous System.
(*b*) The Cardiovascular System.
(*c*) The Respiratory System.
(*d*) The Liver.
(*e*) The Pancreas.
(*f*) The Suprarenal Glands.
(*g*) The Kidneys.

This will be followed by a review of the results of animal experiments and an examination of the theories as to the cause of prolonged coma which have been advanced as a result of the study of the morbid anatomy.

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(A) *The Central Nervous System.*

As has been mentioned, pathological studies of patients who have died from prolonged coma have been confined mainly to the brain, which has also been closely studied in animals subjected to large doses of insulin. A number of the articles in the literature have been reviewed by Lawrence, Meyer and Nevin (1942), who, however, did not restrict themselves to a consideration of changes found in patients dying in post-hypoglycaemic coma during Sakel's treatment, but included also cases of spontaneous hypoglycaemia due to adenomata of the pancreas, and also diabetics who had developed hypoglycaemia through an overdose of insulin. As the latter patients, especially, were not physically normal at the time when they became hypoglycaemic, as are the patients undergoing Sakel's treatment, reports on their morbid anatomy will not be considered.

The general pathological findings in the central nervous system in the reported cases may be summarized as follows: The neurones may suffer from general or localized ischaemia, which may be so severe that the entire neurones may disappear. The neurones of the frontal, temporal and occipital lobes are more frequently affected than those of other lobes, with the heaviest incidence of damage falling on the Cornu Ammonis and its Sommer sector in ticular. There is a reactive response, either proliferative or degenerative, on the part of the glial elements, while the blood vessels show a proliferative endarteritis, with perivascular exudation, neoformation of blood vessels, pseudocalcification of the media and sometimes thrombosis in the cerebral vessels. These changes will now be considered in detail as they affect the various parts of the brain.

(1) *Meninges.*

The condition of the meninges has not usually been reported on, but Ferraro and Jervis (1939*a* and 1939*b*) noted that in one case they were normal with marked congestion of the meningeal blood vessels, while Gralnick (1941) found the same congestion of the blood vessels in meninges which were transparent to the naked eye.

(2) *External Appearance of the Brain.*

De Morsier and Mozer (1936) found no naked-eye changes in the brain of a morphine addict who had died in prolonged coma following treatment with insulin, as did Ferraro and Jervis (1939*b*) in 4 schizophrenia patients. Similar findings have been reported by Cammermayer (1938), Jacob (1939), Jansen and Waaler (1940) among others. Gralnick (1941), however, found that the brain of a patient dying after 10 days of prolonged coma was oedematous with narrow, shallow sulci.

(3) *Internal Structure of the Brain.*

(a) *Neurones.*—There is a considerable degree of unanimity in the reports of the changes found in the neurones by various authors, although some confusion exists through the use of different stains and a somewhat loose termino-

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logy to describe the changes found. Reports of detailed histological studies of the brain have been published by, *inter alia*, Cammermayer (1938), Doring (1938), de Morsier and Mozer (1936), Ferraro and Jervis (1939*a* and 1939*b*), Gralnick (1941), Jacob (1939), Jansen and Waaler (1940), Kastein (1938*a*, 1938*b*, 1938*c*), Kobler (1938), Leppien and Peters (1937), Lawrence, Meyer and Nevin (1942), Salm (1937), Scherb and Stone (1938), Timmer (1938), and MacKeith and Meyer (1939).

As regards the changes in the individual neurones, these have been found to vary from the slightest to the most profound, from chromatolysis, shrinking, vacuolysis, swelling of the nucleus, eccentric placing of the nucleus, homogeneous cytoplasm, swelling of the Nissl bodies, to complete disappearance of the neurones. On the other hand, the neurones might be shrunken, deeply stained, with irregular nuclei and distorted dendrites, or elongated and triangular with sharp edges, the cytoplasm being homogeneous and eosinophilic, the nucleus eccentric—Spielmeyer's ischaemic degeneration.

The distribution of these changes in the neurones varies according to different authors, although some areas are more frequently reported as being affected than others. Cammermayer (1938) found that the superficial sub-pial layers were the most affected, but that generally the cortical changes had no elective character. Usually, while almost every neurone in the cortex might appear to be more or less affected, the portions of greatest devastation were frequently limited to areas about 1 cm. sq. The frontal, parietal and occipital lobes were more frequently markedly affected than other areas [Cammermayer (1938), Ferraro and Jervis (1939*b*), Gralnick (1941), Leppien and Peters (1937), MacKeith and Meyer (1939), and Salm (1937)], and in particular the Sommer section of Ammon's horn appeared to be unusually vulnerable. As regard the layers of the cortex, the more superficial layers were more affected than the phylogenetically older lower ones. Brodman's third layer seemed to be electively affected in a number of cases, producing an effect of pseudolamination. Cells around the calcarine fissure were particularly well preserved in a case of Doring (1938), which led the author to ascribe a vascular origin to the condition.

In the *basal ganglia* similar changes to those occurring in the cerebral cortex have been described by Cammermayer (1938), Ferraro and Jervis (1939*a* and 1939*b*) and Leppien and Peters (1937). As a rule, however, the changes in the basal ganglia were not as profound as those in the cortex.

In the *midbrain* and *medulla oblongata* some nerve cells are usually affected, but only to a mild degree compared to the changes in the cortex [MacKeith and Meyer (1939)].

In the *cerebellum* Ferraro and Jervis (1939*b*) and Gralnick (1941) found that the Purkinjë cells were deeply involved, numerous cells having completely disappeared. Of those that remained, the nuclei showed marked alterations ranging from chromatolysis to vacuolization and colliquation. Similar lesions were found in the inferior olive. In MacKeith and Meyer's (1939) case, however, the changes in the cerebellum were comparatively slight, the Purkinjë cells being somewhat paler than usual and the lipoid content of the neurones in the olivary body being probably a little increased.

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It appears from the above review that the effects of hyperinsulinism upon the part of the brain depend upon the phylogenetic age of the part. The phylogenetically young portions, especially the highly developed occipital, parietal and frontal lobes appear to be particularly vulnerable. Of the layers of the cerebral cortex, the more superficial layers, and especially Brodman's third layer, appear to be more easily affected than the deeper, older layers. On the other hand, the phylogenetically older portions of the brain, the medulla and midbrain appear to be affected to a much more limited degree.

(b) *Neuroglia.*—All elements of the glial tissue react to the damage sustained by the neurones in prolonged hypoglycaemia. In the published reports attention is usually devoted to the microglia, the reaction of which is usually of a proliferative type, as shown by Ferraro and Jervis (1939*a* and 1939*b*), Leppien and Peters (1937), and Scherb and Stone (1938). The reaction may, however, be of a degenerative kind. Ferraro and Jervis (1939*b*) had one case in which the neuroglia showed amoeboid changes and clasmatodendrosis throughout the entire cortex. Hypertrophic changes in the microglia and red cells were observed in areas of major destruction of the neurones. MacKeith and Meyer (1939) and Lawrence, Meyer and Nevin (1942) have drawn attention to the marked changes which occur in the macroglia in addition to those to which the microglia is subject. The use of Holzer and Globus-Cajal preparations is necessary to show fully the proliferation of the macroglia, and the use of Nissl's stain only by most other workers probably accounts for the little attention the macroglia have received, as they do not stain well with the latter stain. The outstanding feature of MacKeith and Meyer's (1939) case was the great mobilization and proliferation of the macroglia affecting mainly the sub-pial layer, and to a varying degree the white cerebral and cerebellar matter and the globus pallidus.

(4) *The Blood Vessels of the Brain.*

Two of Ferraro and Jervis's (1939*a*) 5 cases showed no changes either macroscopic or microscopic in the blood vessels, but these cases are exceptional and difficult to explain. In most of the reported cases all the coats of the arteries appear to be affected, but the heaviest incidence of damage falls upon the endothelium [Cammermayer (1938), Ferraro and Jervis (1939*a*, 1939*b*), Gralnick (1941), Jansen and Waaler (1940), Kastein (1938*a*, 1938*b*, and 1938*c*) and Salm (1937)]. The walls of the arteries become greatly thickened owing to proliferation of the cells with narrowing or even obliteration of the lumen. This proliferation is most marked in the endothelium, but it is also shared by the adventitial cells. The nuclei are swollen, and the chromatin granules are darkly stained and increased in numbers. Some cells show varying stages of karyokinesis. Thrombi, secondary to the proliferation of the intimal cells, are frequently seen, as is also diapedesis of both erythrocytes and leucocytes. Perivascular haemorrhages also occur by rhexis. Cammermayer (1938), MacKeith and Meyer (1939) and Lawrence, Meyer and Nevin (1942) also found pseudo-calcification in the media of the pallidal vessels. The degree of vascular change is in direct proportion to the degree of change

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in the neurones and is most marked in the areas of greatest devastation, in which many of the neurones have been completely destroyed. It is this close association between the degrees of vascular and neuronic change which has led several authors to postulate a vascular cause for the changes in the nerve cells. Ferraro and Jervis (1939*a*, 1939*b*) noted that the degree of vascular damage was also directly proportional to the quantity of insulin the patient had received, and found extreme vascular damage only in cases which had received very high doses of insulin.

Another change noted by most of the above authors is that of neoformation of blood capillaries, and here again the process was in direct proportion to the amount of cellular damage in the nervous system.

As regard the veins, several authors have found thrombosis affecting veins of various sizes, while Kastein (1938*c*) describes a case in which the superior longitudinal sinus was thrombosed.

(B) *Changes in Systems other than the Central Nervous System.*

Jansen and Waaler (1940) and MacKeith and Meyer (1939) appear to be the only authors who have made a detailed study at autopsy of organs other than the brain in fatal cases of prolonged coma. This is unfortunate, as such a study would probably shed some light on the problem as to whether the vascular or neuronic changes in the brain are primary. If the vascular changes were found in all the capillaries of the body the vascular hypothesis might be true, whereas if it were found that they were restricted to the brain, it would be presumptive evidence that the neuronic damage was primary and the vascular changes secondary in character.

(1) *Heart.*

Jansen and Waaler (1939) found only slight changes in the myocardium, while MacKeith and Meyer (1939) noted that the cavities were enlarged with flattened columnae carneae. No microscopical examination was apparently made in either case.

(2) *Lungs.*

Any changes in the lungs which might be due to the action of the insulin are usually masked by the terminal congestion of cardiac origin or pneumonia from which the patients finally die [Jansen and Waaler (1940), Salm (1937)]. Cammermayer (1939) noted the presence of "pneumonic infiltration," while Timmer (1938) found congestive haemorrhages. These were apparently not investigated microscopically, and it is interesting to speculate whether they were of the same nature as the haemorrhages usually found in the brain and described above.

(3) *Liver.*

Fatty degeneration of the liver was noted by Cammermayer (1939), Jansen and Waaler (1940), Kastein (1938*c*) and Timmer (1938). MacKeith and Meyer (1939) found only "very great congestion."

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(4) *Pancreas.*

Jansen and Waaler (1940) found considerable change in the pancreas, but ascribed it to post-mortem autolysis. In MacKeith and Meyer's (1939) case there was no superficial evidence of disease of this organ.

(5) *Suprarenal Glands.*

The only reports of examination of the suprarenal glands are those of Schereschewsky, Mogilnitsky and Gorjaewa (1929) and Jansen and Waaler (1940), who in 4 cases found a large increase in the lipoid content of the cortex. This finding is of interest in view of the close association of the suprarenal cortex with carbohydrate metabolism, and of the administration by several authors of the hormone of the suprarenal cortex to patients suffering from post-hypoglycaemic coma.

(6) *Spleen.*

Salm (1937) noted that the spleen was moderately enlarged in one of his cases.

(7) *Kidneys.*

MacKeith and Meyer (1939) found on microscopic examination of the kidneys that they showed "widespread ischaemic degeneration of the glomerular arterioles and capillaries." There were numerous areas of cortical necrosis, corresponding to whitish patches already seen with the naked eye. These were probably secondary to the severe arteriolar degeneration. The kidney changes were recent; pyelonephritis could be excluded, but the authors were doubtful as to their significance. It may be that they were analogous to the changes seen in the cerebral blood vessels, and that the areas of cortical necrosis correspond to the areas of neuronic devastation so frequently found. If this explanation be correct, the vascular theory as to the primary cause of the changes in the brain in prolonged coma would be confirmed.

(c) *Brain Pathology in Animal Experiments in Hyperinsulinism.*

The results in experiments on animals, usually dogs, cats and rats, given large divided doses of insulin over periods of days and weeks approximate so closely to the results found at post-mortem examination of patients who have died from prolonged coma during Sakel's treatment that no purpose would be served by reviewing the literature on the subject in detail. Instead, attention will be concentrated on any additional information which may be elicited under the more controlled conditions under which animal experiments can be conducted. The following papers have been consulted for this study: Schereschewsky, Mogilnitsky and Gorjaewa (1929), Stief and Tokay (1932), Dunner, Ostertag and Thanhauser (1933), Tani (1935), Schmid (1936), Baker and Lufkin (1937), Sherril and MacKay (1937), Massazza (1938), Weil, Liebert and Heilbrunn (1938), Accornero (1938), Roizin (1939), Baker (1939), Appel,

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Alpers, Hastings and Hughes (1939), Winkelman and Moore (1940), Finley and Brenner (1940), Gellhorn, Packer and Feldman (1940), Tyler and Ziskind (1940) and Ziskind and Tyler (1940).

Two factors which the results of animal experiments appear to elucidate are: (1) the possibility that the changes in the central nervous system described by various authors following fatal hyperinsulinism may be due to post-mortem changes, and (2) the relationship between the dosage of insulin employed and the degree of cerebral damage found at autopsy.

Baker and Lufkin (1937) gave insulin to rabbits under similar conditions to those of Sakel's hypoglycaemic treatment and killed the animals 5 days after the cessation of treatment. Microscopic examination revealed "no cell alterations of pathological significance and only an occasional haemorrhage into the brain or meninges. Our experimental observations would, therefore, seem to add weight to our impression that in the human cases, the cellular alterations were most likely of a post-mortem nature." Against this, however, we have the reports of a number of authors, e.g. Weil, Liebert and Heilbrunn (1938), Stief and Tokay (1932 and 1935), Finley and Brenner (1940), Winkelman and Moore (1940) and Roisin (1939), who found marked pathological changes in brains which had been fixed in formalin immediately the animal died. As in the case of Schmid (1936), Baker and Lufkin found such little evidence of abnormality owing to the low dose of insulin employed, and to the fact that their animals did not die in hypoglycaemia.

Several authors discuss the relationship between the dosage of insulin, the severity of hypoglycaemic symptoms and the degree of cerebral damage found post-mortem. Tani (1935) found that the severity of the post-mortem changes did not run parallel with the number of fits the animal had had during hypoglycaemia. In some cases with 10 fits no changes were found, while in others severe changes were found after only a few fits. Tani believes that this difference is related to differences in degree of curvature of the stem arteries. Appel *et al.* (1939) also failed to find such a relationship; one animal which had 56 convulsions showed no post-mortem changes in the brain, while others who had had fewer convulsions showed moderate degrees of ischaemia. Similarly, these authors found no direct relationship between the dosage of insulin employed and the severity of the post-mortem changes. Weil, Liebert and Heilbrunn (1938) found such a relationship, and thus rabbits which "received the largest number of units also showed the most marked histopathological changes. With doses up to approximately 60 units visible disease of the neurones was not produced; from 70–150 units somewhat more marked changes were seen, and with from 200–400 units severe damage was produced. The number of seizures alone is without significance as an indicator of the histopathological changes. What counts is the cumulative effects of repeated injections of large single doses of insulin."

The finding that the number of hypoglycaemic convulsions bears no relation to the degree of cerebral damage is in harmony with the work of Winkelman and Moore (1940), who found that even large numbers (up to 20) of cardiazol-induced convulsions produced little or no change microscopically in the central nervous system.

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Tyler and Ziskind's results agree with those of Weil, Liebert and Heilbrunn (1938). as they found that the larger the dose of insulin used, the greater was the incidence of brain damage found post-mortem. "However," these authors add, "irrespective of the insulin dose, brain damage did not occur unless the animals were kept in the 'medullary stage' of hypoglycaemia for at least 100 minutes." This time-factor in the production of cerebral damage by hypoglycaemia appears to have been investigated by Tyler and Ziskind only, other authors taking account solely of the dosage of insulin employed. In the same year Ziskind and Tyler (1940) produced 3 groups of animals showing varying degrees of cerebral damage by the use of increasing doses of insulin. The groups were: (1) Those with variable degrees of cortical damage only; (2) thalamic preparations; and (3) midbrain preparations. The authors comment: "The demonstration of a gradient effect by insulin on the central nervous system may have a very significant bearing on insulin-shock treatment. The same effects as those now obtained may occur with milder but more prolonged degrees of hypoglycaemia, capable of affecting the higher centres but sparing the lower medullary centres. This would remove the present hazards of the treatment." Unfortunately, this is not borne out by experience, as Cases 1 and 2 of prolonged coma reported above show. For want of a more definite standard, it may be said that it is the total number of milligram/minutes of hypoglycaemia to which the tissues are subject which determines the degree of cerebral damage, and a moderate degree of hypoglycaemia unduly prolonged will have a great, if not greater adverse effect as a large dose acting for a correspondingly shorter time.

It is interesting to note that Schereskewsky, Mogilnitsky and Gorjaewa (1929) found many degenerative changes in the suprarenal glands, in addition to those in the nervous system, including the ganglion cells and neurones of the sympathetic system.

(D) *Causes of Brain Damage Following Hyperinsulinism.*

A number of theories have been advanced as to the cause of the pathological changes in the brain following hyperinsulinism.

(1) The *vascular theory* is that the blood vessels are primarily affected by the hypoglycaemia, and as a result of the endothelial proliferation, venous and capillary thromboses, perivascular exudation and diapedesis of red blood corpuscles; the blood supply to the neurones is interfered with, and the cells undergo changes varying from slight swelling to necrosis as a result. This theory is subscribed to by Doring (1938), Ferraro and Jervis (1939*a*, 1939*b*), Jacob (1939), Jansen and Waaler (1940), Leppien and Peters (1937) and Kastein (1938*b*), although in another paper (1938*c*) the last author prefers a "toxic-metabolic" origin. In favour of the vascular hypothesis is the focal character of the pathological changes, which often have a definite circulatory distribution, although in animal experiments Winkelman and Moore (1940) and Stief and Tokay (1932, 1935) found that almost every cell in the nervous system was affected.

(2) The *anoxic theory* is similar to the above, but attributes the pathological changes to intracellular anoxia rather than to diminished oxygenation due

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to a reduced blood supply from the affected blood vessels. MacKeith and Meyer (1939), Ferraro and Jervis (1939*a*, 1939*b*), Weil, Liebert and Heilbrunn (1938) mention this hypothesis, which is based on the histological similarity between the effects of hypoglycaemia, and anoxia. Lawrence, Meyer and Nevin (1942) review points of similarity between the two conditions, but as these authors point out, it has been abundantly shown, e.g. Damashek, Myerson and Stephenson (1935) and Himwich, Bowman, Wortis and Fazekas (1937), that in hypoglycaemia there is no lack of oxygen in the blood, but an inability on the part of the tissues to utilize that oxygen owing to a deficiency of glucose in the cells resulting from the hypoglycaemia.

(3) The *toxic-metabolic theory* mentioned by Kastein (1938*c*), Ferraro and Jervis (1939*b*) and Jacob (1939) is that the insulin has a direct histotoxic action on the cells of the nervous system, but in the absence of experiments upon the effects of insulin upon isolated tissues, this remains an hypothesis.

(4) The *oxyachrestic theory* has already been mentioned in connection with the anoxic theory. The word oxyachrestia has been coined by Lawrence, Meyer and Nevin (1942) to emphasize that although the blood contains sufficient oxygen in hypoglycaemia, the tissues are unable to utilize the oxygen owing to a deficiency of the substrate-glucose. This possibility was mentioned by Ferraro and Jervis (1939*a*) among other authors. The word oxyachrestia is inadequate, as it gives no indication as to the cause of the cell's inability to use oxygen. A better term would be *aglucia*, as aglucaemia is already used for an absence of glucose from the blood, so aglucia would refer to an absence of glucose from the tissue-cells (*cf.* anoxaemia—anoxia). Terminological finesse apart, the theory has probably more supporting evidence than those given previously. This evidence will be reviewed in the section on Clinical Pathology, as a considerable amount of work has been done on cellular respiration in hypoglycaemia, especially by Himwich, Wortis and their associates.

It may be noted in passing that all the theories outlined above seek the cause of the pathological changes in the brain following hypoglycaemia in the brain itself, either in the neurones or the blood vessels. This is probably because detailed post-mortem attention has usually been restricted to the brain, especially in human subjects. As has been mentioned above, only two authors, MacKeith and Meyer (1939) and Jansen and Waaler (1940) give detailed reports of the examination of other organs. Yet hypoglycaemia of the severity met with in Sakel's treatment probably affects all tissues throughout the body, and it may well be that the *cause* for the pathological changes in the nervous system lies, not in that system, but in some other system in the body. This becomes the more possible when the complexity of carbohydrate metabolism is borne in mind. It is interesting to note in this connection that Jansen and Waaler (1940) and Schereschewsky, Mogilnitsky and Gorjaewa (1929) found degenerative changes in the cortex of the suprarenal glands after hyperinsulinism, and in view of the part the adrenal cortex is now known to take in carbohydrate metabolism, it may be that the cause of the cerebral changes may be found in the suprarenal gland and not in the brain. Certainly in future post-mortem examinations in cases of prolonged non-hypoglycaemic coma, a detailed microscopic examination should be made of every organ in the body.

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In view of the marked *biochemical* changes which occur in hypoglycaemia and which have been fairly well studied (see next section), and the possibly equally marked biophysical changes which have scarcely been investigated, it is possible that the cause of the pathological changes following hypoglycaemia can never be fully understood from a study of the resulting morbid anatomy, but the study of such morbid anatomy should be as comprehensive as possible.

(2) Clinical Pathology.

In considering the clinical pathology of prolonged coma, the study of the physiological changes which occur during hypoglycaemia is as important as the study of any abnormalities found during the prolonged coma itself. This is because prolonged coma is the end-result of one or more processes which have been going on while the patient has been in hypoglycaemia, and an examination of those processes rather than of the end-result itself may yield the clue as to the cause of the condition. Clinical pathological findings which have been reported during prolonged coma will, therefore, be considered first, after which the physiological changes induced by hypoglycaemia will be reviewed.

Attention has been directed chiefly to the behaviour of the various constituents of the blood, cerebrospinal fluid, etc., during prolonged coma, and in the following review the constituents which have been reported upon will be described separately.

(A) *The Blood.*

(1) *Blood Sugar.*

Soon after prolonged coma was first described, it was recognized that the condition was not accompanied by a low blood sugar, as pointed out by Robinson and Robinson (1940). Very high blood-sugar values such as 280 mgm. per cent. [Molony and Honan (1937), Wortis and Lambert (1939)], 520 mgm. per cent. [Theato (1939)], 295 mgm. per cent. [Horwitz *et al.* (1938)], 576 mgm. per cent. [Ribeiro and di Lascio (1939)] and 230 mgm. per cent. [James, Freudenberg and Cannon (1938)] have been reported. It must be noted, however, that these high blood-sugar values have been found at examinations undertaken at sporadic intervals; frequently only a single estimation has been made during the course of the prolonged coma. Braestrup (1939) found a blood sugar of 155 mgm. per cent. 90 minutes after intravenous interruption, but this had dropped to 30 mgm. per cent. 75 minutes later, so that a high blood-sugar finding is not invariable in the condition. The only report in the literature in which regular blood estimations at fairly frequent intervals were done is that of Proctor and Easton (1942), who found that the blood sugar fluctuated rapidly between 46 mgm. per cent. and 320 mgm. per cent., and did not settle to within normal limits until the patient's clinical condition had markedly improved. It is possible that more intensive investigations would reveal a similar condition in other patients. It is indicative of a serious derangement of carbohydrate metabolism, and a satisfactory explanation of it is difficult to find. On the basis of Himsworth's (1939) " head of pressure "

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theory of the function of the blood-sugar level, it might be thought that the previously glucose-starved cells may be able to utilize glucose supplies under high pressure, but that the attainment of the high level sugar necessary temporarily exhausts the blood-sugar level-maintaining mechanism, so that the blood sugar drops. As the blood-sugar level-maintaining mechanism recovers, so the blood sugar rises to a high level again, only to fall once more as the mechanism again becomes exhausted. This would account for the rhythmical rise and fall in the blood sugar dramatically shown in the chart in Proctor and Easton's report.

(2) *Blood Chloride.*

Compared with the normal 365 mgm. per cent. [Samson Wright (1945)] the blood chloride usually appears to be reduced in prolonged coma. Goldman (1940) reports a "relatively low" blood chloride, while Young, Young and Roucek (1937) found a value of 275 mgm. per cent.; Kant (1940), 209 mgm. per cent. These low values are probably due to excessive loss of chlorides in the profuse perspiration which is such a characteristic of post-hypoglycaemic coma, and indicates the need for maintaining an adequate chloride intake either by mouth or intravenously.

(3) *Blood Urea.*

In the 3 cases in which the blood urea has been estimated, it also appears to be on the low side. Goldman (1940) found a value of 19 mgm. per cent., Scherb and Stone (1938) one of 24 mgm. per cent., and O'Neill (1938) one of 16 mgm. per cent.

(4) *Blood Calcium and Phosphorus.*

In view of the tetanic nature of the myotonic spasms in prolonged coma, the carpo-pedal spasm which is present during the spasms and the ease with which they can be initiated by external stimuli, it might be thought that they were due to a calcium deficiency. Goldman (1940), however, who investigated the levels of blood calcium and phosphorus in prolonged coma, found only values within normal limits.

(5) *Blood Carbon Dioxide.*

Franke (1937) reported that in one of his cases of prolonged coma the carbon dioxide combining power of the blood was 50 volumes per cent., while in a case of Horwitz, Blalock and Harris (1938) the much lower figure of 22 volumes per cent. was found.

(6) *Arterio-venous Oxygen Difference.*

No reports have been published on this important factor in prolonged coma following Sakel's treatment, but Himwich, Bowman and Fazekas (1940) investigated it in a diabetic who died in prolonged coma following an overdose of insulin. The average arterio-venous difference in the oxygen content

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of the cerebral blood was 2·76 volumes per cent., compared with the normal difference of 7·43 volumes per cent. This low value is similar to that found during insulin hypoglycaemia, and indicates that in prolonged coma the cerebral tissues are unable to utilize the oxygen supplied to them despite the fact that the necessary glucose substrate is now circulating in the blood.

(7) *Blood Concentration.*

Quantitative studies in the concentration of the blood in prolonged coma do not appear to have been made, but, amongst others, Goldman (1940) " early recognized that blood concentration was a feature of this reaction because the blood drawn for sugar determinations was thick and dark." Probably the excessive loss of fluid in the profuse perspiration and salivation to which patients in prolonged coma are subject is sufficient cause for the haemoconcentration.

(8) *Blood Counts.*

There appears to be a mild leucocytosis in post-hypoglycaemic coma. Murphy (1939) found a white cell count of 15,000, with 78 per cent. polymorphonuclears, 12 per cent. large lymphocytes, 8 per cent. small lymphocytes and 2 per cent. basophils. McKendree (1938) reported a white cell count of 13,400 with 84 per cent. polymorphonuclears and 16 per cent. lymphocytes. Wechsler (1944) found a leucocytosis of 10,800, and Theato (1939) one of 20,600. Reports of erythrocyte counts are restricted to one by McKendree (1937), whose patient had a haemoglobin value of 70 per cent. and 3,520,000 erythrocytes per c.c., and one by Theato (1939), in whose patient the figures were 90 per cent. and 5,000,000 respectively.

(9) *Blood Culture.*

Murphy (1939) cultured some blood from one of his patients in post-hypoglycaemic coma but the result was negative.

(B) *The Cerebrospinal Fluid.*

(1) *Pressure of C.S.F.*

With a few exceptions the pressure of the cerebrospinal fluid has been found to be normal, but unfortunately the number of manometric readings reported in the literature has been few, and most authors appear to have estimated the pressure from the rate at which the fluid escaped at the time of lumbar puncture. The following authors found normal C.F.S. pressures: McKendree (1938), O'Neill (1938), Horwitz, Blalock and Harris (1938), Goldman (1940), Cleckley and Templeton (1941), Gillman and Parfitt (1938) (one case), Read, Heilbrunn and Liebert (1939), Wortis and Lambert (1939), and Gralnick (1941), who did manometric readings at regular intervals throughout the course of a prolonged coma, found that the pressure was "low." On the other hand, Murphy (1939), Binzley and Anderson (1938), Braestrup (1939), and Proctor and Easton (1942) found slightly increased pressures. These

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last findings may have been due to the patient being in a state of muscular tension when the lumbar puncture was performed. It appears, however, that the intracranial pressure is not raised in prolonged coma, a finding which is all the more interesting in view of the quietening effect which withdrawal of 10–20 c.c. of cerebrospinal fluid has upon a patient in the restless phases of the condition.

(2) *C.S.F. Sugar.*

Compared with the reports of Horwitz, Blalock and Harris (1939) and Goldman (1940), who found no increase in the C.F.S. sugar, high values were found by the following authors: Molony and Honan (1937), 300–360 mgm. per cent.; Murphy (1939), 122 mgm. per cent.; James, Freudenberg and Cannon (1938), 300 mgm. per cent.; Cleckley and Templeton (1941), 100 mgm. per cent.; Binzley and Anderson (1938), 105 mgm. per cent.; Gillman and Parfitt (1938), 135 mgm. per cent.; Ribeiro and di Lascio (1939), 223 mgm. per cent.; Abely and Feuillet (1942), 114 mgm. per cent.; but Braestrup (1939) reported the low figure of 55 mgm. per cent.

These very high values are often higher than the level of the blood sugar [Molony and Honan (1937)], and probably indicate the disturbed condition of carbohydrate metabolism in prolonged coma [Proctor and Easton (1942)].

(3) *Other C.S.F. Constituents.*

Brief reports on other constituents of the C.F.S. such as the chloride and protein content have appeared, e.g. Kant (1940), O'Neill (1938), but they appear to be present within normal limits.

(c) *The Urine.*

As would be expected with the abnormally high blood-sugar values found in prolonged coma, several workers, e.g. Scherb and Stone (1938), O'Neill (1938), Horwitz, Blalock and Harris (1938), Binzley and Anderson (1938), Gillman and Parfitt (1938), found sugar (up to 4 per cent.) in the urine, but as a rule, acetone and diacetic acid were absent. Apart from this finding and again indicative of deranged carbohydrate metabolism, the urine appears to be normal.

From the above review, it will be seen that investigations into the chemical pathology of prolonged coma have been inadequate both in range and intensity. The only clue to the cause of the condition which they afford is that there is undoubtedly a marked derangement of carbohydrate metabolism as shown by the widely fluctuating blood sugar [Proctor and Easton (1942)], the reversal of the usual ratio of the sugar levels in the blood and cerebrospinal fluid and the presence of sugar in the urine. Carbohydrate metabolism is not yet fully understood, but the endocrine system certainly plays a part in it, and it may be that the cause of post-hypoglycaemic coma lies in the effect of prolonged hypoglycaemia on some gland such as the pituitary or suprarenals, rather than on the neurones of the brain. As a result of such action, the

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gland is unable to function properly when glucose is administered, carbohydrate metabolism is deranged, the brain, dependent as it is entirely upon carbohydrate for its metabolism, is unable to utilize the glucose now circulating in the blood and the patient remains in coma.

VIII. Physiological Changes in Hypoglycaemia.

It has been shown in the preceding section that the only positive finding in the chemical pathology of post-hypoglycaemic coma is that there is a profound derangement of carbohydrate metabolism which continues in spite of the administration of adequate carbohydrate. As the carbohydrate mechanism returns to normal, so the patient's clinical condition improves (Proctor and Easton, 1942). Too much attention has probably been paid to the effects of hypoglycaemia upon the nervous system, and too little to its effects upon the known stages of carbohydrate metabolism. In this review of the physiological changes in hypoglycaemia an attempt will be made to determine whether an adequate cause can be found for the derangement of carbohydrate metabolism. It would appear that this derangement is primary, and that the irreversible changes which are found in the brain in prolonged coma are secondary to it, but that once those irreversible changes have occurred *nothing* can reverse them, and that the patient's clinical improvement mentally is due to undamaged portions of the brain taking over the functions of the cells in which irreversible changes have taken place. It will be seen, therefore, that methods of therapy for prolonged coma which are based upon the pathological findings in the brain are unlikely to be successful in view of the irreversibility of the changes found there. If the exact point at which the carbohydrate mechanism becomes deranged can be found, a form of therapy might be devised to correct matters at that point. Better still, means might be found by which the derangement could be avoided.

Much remains unknown about carbohydrate metabolism, but the following scheme, adapted from Samson Wright (1945), summarizes our present knowledge.

(1) ***Intestine***, glucose and amino-acids are absorbed and pass to the liver.

(2) ***Liver*** converts—

(i) Glucose → glycogen → glucose.

(ii) Amino-acids → non-nitrogenous residues and urea.

(3) ***Blood glucose*** formed from liver glycogen and non-nitrogenous residues of amino-acids.

(4) ***Insulin*** acts on—

(i) Liver, stimulating glycogen formation.

(ii) Liver, inhibiting glucose formation from non-nitrogenous residues of animo-acids.

(iii) Tissues, increasing glycogen storage and carbohydrate utilization.

(5) ***Adrenaline, sympathetic N.S., thyroxine*** stimulate conversion of liver glycogen to glucose.

(6) ***Adrenocortical hormone*** stimulates glycogen formation in liver and inhibits new glucose formation.

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(7) *Diabetogenic hormone of pituitary gland* acts on—

(i) Liver, stimulating conversion of glycogen into glucose.

(ii) Liver, inhibiting new glucose formation from non-nitrogenous residues.

(iii) Tissues, inhibiting carbohydrate utilization.

It will thus be seen that carbohydrate metabolism is an extremely complex process. Five endocrine glands and the liver are actively concerned in the cycle, and it may be that the effects of prolonged hypoglycaemia upon the endocrine glands in particular impair their efficiency even after glucose has again been administered, and account for the derangement of carbohydrate metabolism which has been found in post-hypoglycaemic coma.

As in the review of the pathological changes during post-hypoglycaemia, the physiological changes will be described under the headings of the tissue constituents and processes affected.

(A) *Cerebral Metabolism.*

(1) *Oxygen Uptake of the Brain.*

It is known that the brain utilizes only carbohydrate in its metabolism, and that its respiratory quotient is consequently 1·0. Himwich and his associates [Himwich, Bowman, Wortis and Fazekas (1937, 1939*a* and 1939*b*); Himwich and Fazekas (1937*a*, 1937*b*); Himwich, Frostig, Fazekas and Hadidian (1939); Himwich, Frostig, Fazekas, Hoagland and Hadidian, (1939); Himwich, Martin, Alexander and Fazekas (1939); Himwich, Hadidian, Fazekas and Hoagland (1939); Wortis, Bowman, Fazekas and Himwich (1941)] have investigated cerebral metabolism during hypoglycaemia by comparing the differences between the blood in the internal carotid artery and that in the internal jugular vein. A detailed analysis of these authors' work cannot be attempted here, but in general it may be said that their results confirm the observations of Damashek, Myerson and Stephenson (1935), who found a diminished utilization of both glucose and oxygen during hypoglycaemia. Himwich and his co-workers conclude that the inability of the brain to utilize the oxygen supplied to it as evidenced by the reduced arteriovenous difference is due to the deprivation of the substrate glucose owing to the low blood sugar, so that the condition is not a true anoxaemia. There is sufficient oxygen available in the arterial blood, but the glucose-depleted brain cells are unable to utilize it. Himwich holds that in severe hypoglycaemia such as is met with in Sakel's treatment, even the intrinsic glucose of the brain cells is used up, and this may account for the irreversible changes which occur in prolonged coma. The work of those authors is an extension of that of Olmsted and Taylor (1924), who, however, ascribed their results to anoxaemia, and has been confirmed by Loman (1940, 1941), Rosenberg (1939) and Wortis and Goldfarb (1940*a*, 1940*b*, 1942).

It is possible that the diminished utilization of oxygen might be counteracted by an increased blood flow, but Leibel and Hall (1938), Lennox and Gibbs (1932), Gibbs, Gibbs and Lennox (1935) and Lennox, Gibbs and Gibbs (1938) could find no evidence of any increase in the blood flow. Yesinick

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and Gellhorn (1939–40), Gellhorn (1938), Gellhorn, Darrow and Yesinick (1939), Gellhorn, Ingraham and Moldawsky (1938*a*, 1938*b*), Yesinick and Gellhorn (1939–40) and Gellhorn, Packer and Feldman (1940), working on the association between hypoglycaemia and anoxaemia, found that hypoglycaemia potentiates the increased blood pressure response to intracranial pressure, which if the intracranial pressure were raised in the hypoglycaemia of Sakel's treatment, would cause a greater flow to the brain. As has already been seen, however, the intracranial pressure is not so raised, so that the brain does not receive any extra blood for this reason. It therefore appears that as far as the brain is concerned, one of the main effects of hypoglycaemia is to deprive the neurones of their glucose, without which they cannot utilize the available oxygen. It is interesting to note in this connection that Holmes (1930) pointed out that the dependence of the neurones upon glucose for oxidation is far greater than that of other parts of the nervous system, such as the white matter.

It is interesting to speculate whether this state of "aglucia" of the brain cells is primary to the numerous other changes, such as electrolytic changes, seen in the body in hypoglycaemia, whether the electrolytic changes are not due to the effect of the hypoglycaemia on some other organ such as the suprarenal cortex, and whether it is the aglucia or the electrolytic changes which prevent the cerebral metabolism from returning to normal in prolonged coma.

(2) *Mineral Content of the Brain.*

Liebert and Heilbrunn (1940) studied microincinerated sections of the brains of rabbits who had been treated with insulin along the lines of Sakel's treatment, and found that, while there was no change in the total ash content of the brain, marked changes occurred in the ganglion cells in the form of dust formation, hypomineralization, vacuolation, or complete demineralization. The changes were especially prominent in the cells of Ammon's horn. There was an increase in the mineral content of the glial tissue. Biopsy showed that these changes were present after an insulin convulsion, but became reversed after a certain time.

Yannet (1939), experimenting on cats, concluded that hypoglycaemia caused a shift of potassium from the cell to the extracellular tissues accompanied by a marked shift of intracellular water, and suggested that the osmotic equilibrium is maintained under these conditions by a transfer of sodium across the cell membrane.

(3) *Water Content of the Brain.*

As mentioned above, Yannet (1939) found that water passed from the interior of the cell to the extra-cellular spaces in hypoglycaemia but later returned as sodium permeated into the cell. He was unable to find any changes in the total water of the brain. This conclusion was also reached by Hall (1938) from experiments conducted by Sniffen and Irwin.

(4) *pH of Brain.*

This has been studied by Marshall, McCullock and Nims (1939), who found that the pH of cerebral cortex remained unchanged for from 60–90 minutes

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following the injection of insulin, after which it underwent a series of striki fluctuations, consisting of an abrupt rise followed by a slower fall. The fluctuations recurred at short intervals, and in the intervening periods th pH was relatively constant. No corresponding changes in the pH of the bloo could be found, and as the chemistry of the changes is unknown the author could offer no explanation for them.

(5) *Permeability of Brain Cells.*

Spiegel and Spiegel-Adolph (1939) found a marked increase in the permeability of the walls of the brain cells, and that in general the change was proportional to the duration of hypoglycaemia. This increased permeability of the cell wall helps to explain the movements of electrolytes to and from the cell and as the authors point out, " repeated injuries of the cell membrane may eventually result in more severe lesions of the cells, as shown by the histological examination after prolonged convulsion treatment."

(B) *Changes in the Blood.*

The changes in the constituents of the blood during hypoglycaemia have been reviewed by Katzenelbogen (1940), whose findings may be summarized as follows: There is, of course, the fall in the blood sugar to which further reference is unnecessary. The levels of potassium, urea-nitrogen and amino-acids fall steadily throughout the period of hypoglycaemia, while that of inorganic phosphorus falls for the first 2 hours and then rises; calcium and magnesium appear to be unaffected, while there is conflicting evidence as to the behaviour of the sodium and chlorides.

(C) *Changes in the Cerebrospinal Fluid.*

The cerebrospinal-fluid sugar follows, but lags considerably behind the blood sugar [Day and Niver (1937); Day, Niver and Greenberg (1938)]. After interruption of the hypoglycaemia with glucose, the C.S.F. sugar lags behind the blood sugar in its return to normal, so that the patients' return to consciousness may be associated with a more or less marked hypoglycorrhacia.

(D) *Electroencephalographic Changes.*

Himwich, Frostig, Fazekas, Hoagland and Hadidian (1939) and Himwich, Hadidian, Fazekas and Hoagland (1939) found that there was a direct relationship between the frequency of the alpha waves and the cerebral oxygen consumption, both declining during hypoglycaemia and increasing after the administration of glucose. The delta index displays an inverse relationship, and becomes augmented during the period of diminished oxygen utilization of the brain. This work has been confirmed, *inter alia*, by Gibbs, Williams and Gibbs (1940).

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(E) *Changes in Other Organs.*

These changes have already been considered in the section on the pathology of post-hypoglycaemic coma. They have been studied by Tannenberg (1939), whose work has been confirmed by other authors. Tannenberg found that insulin given to rabbits along the lines of Sakel's treatment produced :

(1) *In the heart and skeletal muscles*—definite hydropic changes. The posterior wall of the left ventricle and its papillary muscles were the site of selection in the heart, as were the iliopsoas and thigh muscles among the skeletal muscles. The changes consisted of broken muscle fibres of all stages. Most of the changes were considered reversible, but small areas of necrotic cardiac cells were found.

(2) In the *liver* two types of reaction were found :

(*a*) Where the liver was able to release all the glycogen synthesized from various sources before and after the administration of insulin the fall in the blood sugar was not very marked, and damage to vital organs did not result.

(*b*) Where the liver retained the available carbohydrate as glycogen and locked it up, particularly in the centres of the lobules, which became overladen, with constriction of the capillaries, the blood sugar fell to low levels and the heart and musculature showed severe damage. Small areas of necrosis in the liver were observed especially in rabbits treated with high doses of insulin. Terron and Malesani (1939), using the Weltmann and Taka-Ara reactions, were unable to detect any dysfunction of the liver, but in view of the unreliability of liver function tests, Tannenberg's results would seem to be more accurate.

(3) As mentioned earlier, a number of authors have found changes in the cortex of the suprarenal gland which are of interest in view of the ionic changes found in hypoglycaemia, and the probable part which the adrenal cortex plays in the control of ionic changes in the tissues.

From the above summary it will be seen that the only factors which emerge from a study of the physiological changes in hypoglycaemia and which may help in the search for the cause of prolonged coma are :

(1) There is a marked reduction in cerebral metabolism owing to the depletion of the substrate glucose, and, since the brain can only use carbohydrate in its metabolism, prolonged deprivation of glucose may lead to irreversible changes in the cerebral neurones for one of two reasons :

(*a*) Irreversible changes within the neurones themselves.

(*b*) Damage to a part of the carbohydrate controlling mechanism, such as the pituitary gland, sympathetic nervous system, adrenal glands, etc., so that the cerebral neurones are unable to utilize the carbohydrate available in the blood stream after the administration of glucose.

(2) There is a shift of potassium and other electrolytes from the cerebral neurones into the intracellular spaces and glial tissues. A point may be reached

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at which these ionic changes become irreversible for one of two reasons similar to those by which the cells cannot utilize their available glucose :

(*a*) The intracellular ionic changes may have resulted in irreversible changes in the structure of the cell as far as the electrolytes are concerned.

(*b*) The mechanism controlling the ionic balance of the body (e.g. adrenal cortex) may be damaged, so that the ionic intracellular arrangements cannot return to normal.

Until more is known of the nature, site and cause of the irreversible changes which accompany prolonged hypoglycaemia, the exact cause of prolonged coma will continue to elude us.

IX. Symptomatology of Post-Hypoglycaemic Coma.

The description of the symptoms of prolonged coma is made more difficult by the varying degrees of severity of the condition which may be encountered. In mild cases, as Case 2 reported above, the patient merely remains unconscious, no symptoms indicative of focal involvement of the nervous system develop, the temperature is only moderately raised, the general condition remains good, and in a matter of hours or days the patient regains consciousness, and in a comparatively short period shows no signs of mental enfeeblement as the results of his experience.

In more severe cases the picture is different. The temperature is raised considerably, up to 105° F., the pulse varies from 110–160 per minute, and the respiration rate is usually 30–40 per minute. The patient is deeply unconscious. Babinski plantar responses may be present for some hours, but the corneal reflex can usually be elicited. A characteristic feature during the first 24–48 hours of severe prolonged coma is the intense myotonic-clonic spasms, which, beginning gradually, become more and more intense until the patient may assume a position of almost complete opisthotonos. These spasms last about 10 minutes and may recur every 10–15 minutes unless they are controlled by intravenous barbiturate or rebreathing. The patient is doubly incontinent, perspires and salivates freely and may vomit any food given by nasal or oesophageal tube. Gradually, again in a matter of hours or days, the myotonic spasms cease, the Babinski responses disappear, the temperature falls, and the patient slowly regains consciousness, and as he does so various signs and symptoms indicating focal lesions of the brain may become apparent. There may be Jacksonian fits (Wortis and Lambert, 1939), spastic deviation of the head and eyes (Scherb and Stone, 1938), hemiplegias (Read, Heilbrunn and Liebert, 1939), paralysis of the ocular muscles (von Pap, 1937), chewing movements (Kant, 1940), facial paralysis (Binzley and Anderson, 1938). The patient's speech is at first dysarthric and aphasic, but gradually returns to normal. His movements in general are clumsy and unco-ordinated and he walks on a broad base. As his condition improves, memory defects of an organic kind are frequently seen. The commonest of these is Korsakov's syndrome, reported by Milch and Bolles (1938), Horwitz, Blalock and Harris (1938) and Billig and Sullivan (1942) amongst other authors. Other memory defects which may occur are retention defects as reported by Kant (1940),

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hose patient was able to remember remote events but not recent ones, nd misidentification of persons (Horwitz, Blalock and Harris, 1938). The ate of improvement depends upon the severity of the prolonged coma, and it nay be days, weeks or months before the patient regains his precomatose evel. Some, as will be seen, never reach it.

X. Prognosis of Post-hypoglycaemic Coma.

Prolonged coma may end in (1) death, (2) physical recovery with improvement in original psychosis, (3) physical recovery without improvement in the original psychosis, (4) physical recovery with varying degrees of dementia.

The mortality rate in post-hypoglycaemic coma varies within fairly wide limits. Lester (1938–39) had a mortality rate of 16 per cent. in 25 patients, Rivers and Rome (1944) one of 5 per cent. in 51 cases; Goldman (1940), however, had no fatalities among his 23 cases.

Death usually occurs either from supervening pneumonia or from myocardial collapse. The latter is the commonest cause of death, and is probably due to the fact that the myocardium has already been damaged by the hypoglycaemia intentionally induced.

A number of authors, e.g. Rossman and Cline (1937–38), Lester (1938–39), McKendree (1938), Katzenelbogen (1939), Coyne (1940), James, Freudenberg and Cannon (1938), have reported cases which improved very considerably following the development of prolonged coma, and following his own similar experience Kraulis (1937, 1938) produced protracted comas of up to 12 hours' duration, with a view to increasing the effectiveness of Sakel's treatment. Following up Kraulis' work, Billig and Sullivan (1942) and Wortis, Terris and Korr (1942) have intentionally produced prolonged comas, with, they claim, satisfactory results. These comas are, however, not the same as the post-hypoglycaemic comas now being studied, as the patient is given small amounts of glucose periodically during the coma to prevent the hypoglycaemic state from becoming too profound.

As compared with the above, several authors, e.g. Horwitz, Blalock and Harris (1938), Binzley and Anderson (1938) have reported cases in which no improvement in the patient's psychosis occurred after the post-hypoglycaemic coma, and unfortunately there are many cases reported in which the patient's last condition was worse than his first. The likelihood of any patient improving psychiatrically as a result of post-hypoglycaemic coma is too uncertain to justify its induction for therapeutic reasons.

XI. The Treatment of Post-hypoglycaemic Coma.

The widely varying methods of treatment which have been adopted in cases of prolonged coma indicate that a specific remedy for the condition has yet to be found. This is to be expected, since the actual cause of the condition is, as has been shown earlier, still unknown. If it be assumed that the irreversible changes in the neurones of the brain are the primary cause, the exact nature of those irreversible changes is not known. In the absence of fuller

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knowledge of such changes, it is difficult to suggest ways by which they may be influenced. Most authors have approached the problem from a chemical point of view, stressing the part played by glucose in brain metabolism, but the changes may well be essentially physical and not chemical in nature, and their irreversible character may disappear if the physical milieu of the cells could be changed. If, on the other hand, it is assumed that prolonged coma is essentially due to a breakdown of carbohydrate metabolism, as suggested by the work of Proctor and Easton (1942), the exact point of this breakdown in the cycle of carbohydrate metabolism is unknown, and until it is, a specific remedy for prolonged coma will probably not be found. At present, therefore, treatment for post-hypoglycaemic coma must necessarily be symptomatic—a view insufficiently stressed by most authors.

The forms of treatment which have been tried may be classified as follows:

(1) *Replacement of Tissue-deficiencies.*
   (*a*) Vitamin B_1. (*b*) Nicotinic acid and riboflavine. (*c*) Adrenal cortex hormone. (*d*) Calcium salts. (*e*) Potassium salts. (*f*) Blood transfusion. (*g*) Pitruitrin. (*h*) Insulin.

(2) *Maintenance of the Circulation.*
   (*a*) Administration of fluids. (*b*) Cardiac stimulants. (*c*) Blood-letting. (*d*) Blood transfusion.

(3) *Maintenance of Respiration.*
   (*a*) Oxygen and carbon dioxide. (*b*) Respiratory stimulants.

(4) *Administration of Insulin-antagonistic Substances.*
   (*a*) Adrenaline.

(5) *Lumbar Puncture.*

(6) *Administration of Sedatives.*

(7) *Miscellaneous Forms of Treatment.*

These methods of treatment will now be considered.

(1) *Replacement of Tissue-deficiencies.*

(a) *Vitamin B_1.*—Freudenberg (1937) first asserted that vitamin B_1 was of value in cases of prolonged coma; his experience was that patients who did not respond to oral glucose promptly awoke on the administration of 2·5 mgm. of thiamine chloride. It is known that in the brains of pigeons with B_1 avitaminosis, pyruvic acid and methyl glyoxal are present. Neither of these metabolites is present in normal brain, and they disappear from the avitaminotic specimens when vitamin B_1 is added. They are similarly present in muscle after hyperinsulinism, so that there would appear to be theoretical justification for Freudenberg's findings, especially as the large amount of carbohydrate usually found in the diet of patients on Sakel's treatment may cause a relative deficiency of vitamin B_1 (Goldfarb and Bowman, 1941). Himwich, Spies, Fazekas and Nesin (1940) found a reduction in the arterio-venous oxygen difference in pellagrous patients similar to that found in the milder stages of hypoglycaemia. Later authors, however, in general have failed to confirm Freudenberg's results. Akos (1939) claimed that the previous

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administration of vitamin B_1 reduced the amount of restlessness during coma, but this could only be partially confirmed by Somerfeld-Ziskind *et al.* (1942). Rossman and Cline (1937–38) and Finiefs (1938*a*) recommend the use of vitamin B_1 in prolonged coma, but Wortis and Lambert (1939), O'Neill (1938), Cleckley and Templeton (1941), Gillman and Parfitt (1938), Ribeiro and di Lascio (1939), Freed and Saxe (1939), Rivers (1941) and the present author found that it did not affect the progress of the coma. Somerfeld-Ziskind *et al.* (1942), using the vitamin orally, intramuscularly and intravenously, found that it did not affect the " arousal from coma " times of 27 patients compared with a control series.

In view of these findings it must be concluded that vitamin B_1 has no specific effect in prolonged coma.

(b) *Nicotinic acid and riboflavin.*—Cleckley and Templeton (1941) gave 150 mgm. nicotinic acid and 15 mgm. riboflavin without apparent effect.

(c) *Adrenal cortex hormone.*—Goldman (1940) found that adrenal cortex hormone (cortin) had a marked quietening effect on two of his cases, but the fact that it was given in one case daily for 10 days indicates that it had no specific effect. The part played by the adrenal cortex in carbohydrate metabolism is a complicated one, and a number of substances have been isolated from it which have varying effects. One substance acts like insulin in promoting glycogen formation in the liver [Samson Wright (1945)], but another [Seyley and Dosne (1939)] counteracts the changes in the blood sugar induced by insulin. Seyley and Dosne believe it has a *stabilizing* effect on the blood sugar, and so might be useful in controlling the fluctuating blood sugar found in prolonged coma. Another action of the adrenal cortex is to stabilize the ionic conditions of the tissues which are disturbed in post-hypoglycaemic coma (Rivers and Rome, 1944). There are, therefore, theoretical grounds for believing that adrenal cortex extracts might be of value in prolonged coma, and a further trial of them would be justified now that stronger extracts of more definite composition are available.

(d) *Calcium salts.*—Calcium salts, usually the chloride, have been given to counteract the alkalosis found in post-hypoglycaemic coma, and are recommened by Finiefs (1938*b*), Murphy (1939), James, Freudenberg and Cannon (1938), and Goldman (1940). Gillman and Parfitt (1938), however, found them to be useless.

(e) *Potassium salts.*—Cleckley and Templeton (1941) gave 2 gm. of potassium chloride in 500 c.c. of saline subcutaneously and found that the convulsions ceased after 30 minutes. Skaug and Hellem (1939), however, found in a case of prolonged coma that the blood potassium was higher than normal, although they found that patients with a " long arousal time " after oral glucose quickly responded to the administration of 0·2 per cent. NaH_2PO_4. They maintain that this enables the sugar to be absorbed from the intestine.

(f) *Blood transfusion.*—Reports on the immediate effect of blood transfusion are not available, but Kubo (1937) states that it saved the patient's life in two of his cases, while Wortis and Lambert (1939) were able to treat the condition with " apparent success " by this means, and James, Freudenberg and Cannon believe it to be " of the utmost value." Wortis, Shaskan, Impastato

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and Almansi (1941) believe that whole blood contains enzymic factors (other than glucose) essential to brain metabolism. In the present author's experience these claims have not been confirmed, and any beneficial results following blood transfusion have probably been due to the support given to the circulation by the administration of a large quantity of fluid. A female patient, who went into prolonged coma following intravenous insulin, strikes a warning note [Spencer (1947)]. Although the bloods were cross-matched microscopically to ensure compatibility, a violent rigor followed by a severe degree of cardiac failure occurred. It is probable that the patient, a multipara, was an Rh-negative subject who was transfused with Rh-positive blood. The patient recovered as her general condition was good when the transfusion was started. Had the general condition been poor, as it frequently is when such patients are transfused, the outcome would probably have been fatal. As a precautionary step all patients undergoing Sakel's treatment should have their blood grouped before treatment commences, and the blood-grouping should include the Rh factor.

(g) *Pituitrin.*—Gillman and Parfitt (1938) gave pituitrin (0·5 c.c.), but it does not appear to have influenced the course of the patient's coma.

(h) *Insulin.*—It is interesting to note that some authors [Molony and Honan (1937), Easton (1938), Ribeiro and di Lascio (1939), O'Neill (1938)] have given further insulin (10–30 units) during prolonged coma in view of the high blood-sugar values obtained. There appears to be no justification for such a step since, as Proctor and Easton (1942) have shown, the blood sugar is probably not consistently high, but fluctuates a great deal. This is probably due to a derangement of the carbohydrate metabolism, as the quantities of glucose usually injected in post-hypoglycaemic coma actually represent quite a small carbohydrate intake, and to inject further insulin probably only serves to delay the stabilization of the carbohydrate metabolism still further.

(2) *Maintenance of the Circulation.*

(a) *Administration of fluids.*—Two schools of opinion exist as to the advisability of giving fluids in cases of prolonged coma. The one advocates giving adequate fluids in order to support the circulation in view of the large amount of fluid lost in the profuse perspiration [Fraser and Sargant (1940), Timmer (1938), Theato (1939), Finiefs (1938*a*), O'Neill (1938)]. As has been shown in the section on morbid anatomy, the heart itself is affected by hypoglycaemia and every care must be taken to maintain the circulation, as the commonest immediate cause of death in prolonged coma is either terminal pneumonia or myocardial failure. Intravenous saline can be of much value in this condition, but it needs to be administered with considerable caution since, as in cases of ordinary diabetic coma, it is possible to overload the heart if too much fluid is given by this route, especially if it be given too quickly. Estimations of blood volume are useful, but in general it may be said that isotonic saline through a stomach tube is safer from a cardiac aspect than large quantities intravenously.

Other authors following O'Neill (1938) have sought to promote dehydration

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instead of administering fluids to counteract the dehydration already existing. Rivers (1941) and Rivers and Rome (1944) used solutions of sodium arabinate, dextrosorbitol, mannitol, styracital and concentrated lyophile serum for this purpose. They claim that "in all instances" clinical improvement was obtained within the hour. The administration of dehydrating substances is based on the presence of intracellular oedema of the brain cells, since at post-mortem many of the cells are found in a swollen condition, and Rivers and Rome hold that as a result of ionic changes there has been a passage of water into the cell which is reversed by the giving of dehydrating substances. Whether such a reversal in the absence of the correction of the ionic imbalance is desirable is open to doubt, as the intracellular oedema may be protective in character. That dehydrated animals do not have convulsions during hypoglycaemia was shown by Drabkin and Ravdin (1930, 1937) but Drabkin and Shilkret (1927–28) found that despite this, dogs which had been given fluids invariably recovered on the administration of glucose, whereas those that had been deprived of water for more than 4 days did not survive. Tyler, Greeley and Drury (1939) found that dehydration also leads to an increase in the basal insulin requirements of the depancreatized dog, which would seem to indicate that dehydration increases the difficulty of stabilizing the carbohydrate metabolism. In the absence of fuller clinical details about Rivers and Rome's (1944) patients, it is difficult to assess the efficacy of their dehydrating methods, and until more conclusive evidence of the value of dehydration is obtained it would seem advisable to continue to give adequate amounts of fluids.

(b) *Cardiac stimulants.*—Theato (1939) regarded coramine as the "chosen remedy" for prolonged coma, giving it in the very large doses of 77 gm. in 12 hours, of which 55 gm. were given in 2 hours. Other authors, e.g. Rossman and Cline (1937–38), Gillman and Parfitt (1938) and Easton (1938) have given it in more usual doses with beneficial effect on the cardiovascular and respiratory systems. While it probably does not, as Theato claimed, have a specific action on the myotonic spasms, it is undoubtedly useful in maintaining the circulation. Other cardiac stimulants which have been used by various authors are: caffeine sodium benzoate [Easton (1939), Wortis, Bowman *et al.* (1937), O'Neill (1938)], camphor and sympatol [Theato (1939)], strychnine [Molony and Honan (1937), McKendree (1938)], digitalis [Easton (1939), Murphy (1939), Lester (1938–39), O'Neill (1938)], and cardiazol [Lester, (1938–39)], but none appear to have any effect other than that of supporting the circulation.

(c) *Blood-letting.*—Theato (1939) also recommended the withdrawal of 200 c.c. of blood as a means of supporting the circulation. This would probably prove useful in those cases in which signs of pulmonary oedema indicate the onset of right-sided heart failure.

(d) *Blood transfusion.*—This is a valuable means of supporting the circulation, and has already been considered under a previous heading.

(3) *Maintenance of Respiration.*

(a) *Oxygen and carbon dioxide.*—Continuous inhalation of oxygen and 5 per cent. carbon dioxide through a nasal catheter is most useful, and may tide the

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patient over what would otherwise have been a fatal phase. Its use is reported by Gillman and Parfitt (1938), Strecker (1938), Kant (1940) and Finiefs (1938a). The use of higher concentrations of carbon dioxide or of a rebreathing bag (Goldman, 1940) is useful in cutting short the myotonic spasms if these have been allowed to develop.

(b) *Respiratory stimulants.*—Lester (1938–39) used lobeline to stimulate the respiration, while a large number of authors have given atropine, e.g. McKendree (1938), Wortis, Bowman *et al.* (1937), Goldman (1940), Cleckley and Templeton (1941) and Proctor and Easton (1944). It is certainly most useful when early signs of pulmonary oedema are developing, and in addition to the effect upon the respiration, it reduces the amount of salivation and so minimizes the loss of fluids from the tissue.

(4) *Administration of Insulin-antagonistic Substances.*

(a) *Adrenaline.*—In the early years of Sakel's treatment adrenaline was given almost as a routine in cases of post-hypoglycaemic coma, because of the fact that if equivalent doses of adrenaline and insulin are given intravenously the fall in the blood sugar which would normally follow the injection of the insulin can be entirely neutralized. Strecker (1938), however, found that the administration of adrenaline in prolonged coma increased the incidence of convulsions, a finding confirmed by Horwitz, Blalock and Harris (1938), while Binzley and Anderson (1938) regard its use as undesirable " as it accelerates the rate of an already overworked heart, and any liver glycogen mobilized will be unnecessary because the blood sugar is already normal or above." Wortis, Bowman *et al.* (1937) found that the colour of a patient improved following the injection of 5 minims of adrenaline, but in general, the results of its use have not justified the risk of inducing further convulsions, and the drug would seem to have no place in the treatment of prolonged coma.

(5) *Lumbar Puncture.*

In view of the fact, noticed in a previous section, that the pressure of the cerebrospinal fluid is normal or only slightly raised in post-hypoglycaemic coma, it would appear that lumbar puncture with withdrawal of C.S.F. would not be helpful in the condition. Katzenelbogen (1939), Kant (1940) and Finiefs (1938) amongst others, however, found that it relieved the patients' restlessness, but Fraser and Sargant (1940) were not convinced of its usefulness.

(6) *Administration of Sedatives.*

Patients who die in prolonged coma do so either from exhaustion with myocardial failure or from an added infection such as pneumonia. The severe, generalized myotonic spasms, so frequently found as part of the syndrome, are extremely exhausting and should be controlled as completely as possible. A number of sedatives, e.g. alcohol intravenously [Abely and Feuillet (1941)], paraldehyde [Lester (1938–39)], morphine [Rossman and Cline (1937–38)], and luminal [Theato (1939)], have been given with a view to allaying the general restlessness, but the short-acting intravenous barbiturates such as sodium

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amytal or hexobarbitone are most valuable in aborting and controlling the severe myotonic spasms. Several authors, e.g. Scherb and Stone (1938), Horwitz, Blalock and Harris (1938) and Wortis and Lambert (1939) refer incidentally to their use, but none lays sufficient emphasis on the vital part they play. Ideally, a patient in prolonged coma should never be allowed to have more than one severe myotonic spasm. An intravenous barbiturate should be given at once. Control of the seizure is immediate, and if 1 gm. of the drug is given slowly so as not to produce anaesthesia no seizure will occur for some time. As soon as the seizures restart further barbiturate should be given, and up to 3 gm. of hexobarbitone may sometimes be required over a period of 8 hours, by which time the myotonic spasms will probably have ceased. That the giving of the barbiturate does not retard the recovery of the cerebral neurones follows from the work of Wortis (1935), who showed that barbituric acid derivatives did not depress the respiratory quotient of brain slices in the Barcroft-Warburg apparatus, i.e. they did not prevent the uptake of oxygen by the brain, so that in prolonged coma they should not prevent the recovering brain cells from utilizing the available oxygen as they become able to do so. Indeed, Hrubetz (1938) and Tyler (1940) have shown that the previous administration of barbiturates can prevent the cerebral damage of hypoglycaemia; they can therefore be given with every confidence in prolonged coma.

(7) *Miscellaneous Adjuncts to Treatment.*

Antipyretic methods such as cold packs and alcoholic sponges have been recommended by O'Neill (1938), and ice enemata and iced water lavage by Goldman (1940). Despite the existing alkalosis, Ribeiro and di Lascio (1939) have given sodium bicarbonate, and also a preparation termed "organo-cardio-renal serum" as well as anti-anaemic liver extract ("campolon"). No benefit appears to have accrued from these measures.

As will be seen from the above account, no specific remedy for prolonged coma is available. Nor is one likely to be found until the precise cause of the condition has been discovered. Until that occurs it is necessary to bear in mind that the adverse effects of hypoglycaemia are systemic in character and are not confined to the nervous system. As Dunner, Ostertag and Thanhauser (1933), Ernstone *et al.* (1935), Jorgensen (1940), Tannenberg (1939) and Terron and Malesani (1939), have shown, other systems, and especially the cardio-vascular system, can be directly damaged by hypoglycaemia. In prolonged coma, therefore, we are probably dealing with a heart which has already been damaged. All that can be attempted is to support the circulation as far as possible, and to lighten the demands made upon it by controlling the restlessness and myotonic spasms by the use of intravenous barbiturates.

XII. Theories of Causation of Post-hypoglycaemic Coma.

The large number of theories which have been advanced to explain the cause of post-hypoglycaemic coma indicates that probably none of them is satisfactory. This is because most of the theories do not deal with the funda-

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mental changes which are found in the condition, but content themselves with the discussion of secondary changes which accompany the more fundamental ones. Attention has been devoted too exclusively to the pathological findings in the brain and insufficient attention has been paid to the changes in the other organs; hence the search for the cause of the condition has tended to be limited to the brain, damage to which results in the symptoms of prolonged coma. It is not enough to say that hyperinsulinism causes irreversible changes in the brain; we have to go on to inquire into the causes and nature of these changes, for the cause may not lie in the cells themselves, but in some other organ or organs which control the metabolism of the cells. That is to say, the search for the cause of prolonged coma must be extended to cover the effects of hypoglycaemia in all the tissues of the body, with particular attention being devoted to the organs which play a part in carbohydrate metabolism. It appears that the following facts have not received the emphasis they deserve:

(1) Irreversible changes occur in the cells from prolonged hypoglycaemia, i.e. they cannot be reversed by restoring the blood-sugar level, we need to know the nature of these changes, for it may be possible to affect them in other ways.

(2) These irreversible changes are not restricted to the brain. They occur also in at least the heart (Tannenberg, 1939), the suprarenals (Jansen and Waaler, 1940), and probably the kidneys (MacKeith and Meyer, 1939).

(3) There is a profound disturbance of the ionic balance of the body. This disturbance may itself result in irreversible changes in the cells (Liebert and Heilbrunn, 1940).

(4) There is an equally profound disturbance of the carbohydrate metabolism in prolonged coma (Proctor and Easton, 1942), and it is noteworthy that the improvement in the patient's condition coincides with the return of the carbohydrate metabolism to normal.

These facts indicate that probably the ultimate cause of the post-hypoglycaemic coma is not to be found in the effect of the hypoglycaemia upon what may be called the "terminal" tissues such as the cerebral neurones and myocardial cells, but in its effect upon other tissues which control the metabolism of the "terminal" tissues. Of especial interest in this connection is the effect of hypoglycaemia on the adrenal cortex, the pituitary gland and the sympathetic nervous system, all of which are known to play a part in the cycle of carbohydrate metabolism.

The various theories which have been advanced to explain post-hypoglycaemic coma will now be briefly reviewed in the light of the above remarks, and therefore, with the proviso that most of them are concerned with changes which accompany prolonged coma rather than with its cause.

(1) *The Vascular Theory.*
(2) *The Anoxic Theory.*
(3) *The Toxic-metabolism Theory.*
(4) *The Oxyachrestic or Aglucic Theory.*

These theories have already been examined in Section VII above.

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(5) *The Autonomic Imbalance Theory.*

A great deal of work has been done on the behaviour of the autonomic nervous system during hypoglycaemia. Parker (1940) holds that both the sympathetic and parasympathetic divisions are stimulated, while Wespi (1938) believes that " the autonomic response to insulin may vary from day to day in one and the same patient." These changes are probably brought about by the action of insulin on the hypothalamus, and if they become too severe, the cells of the hypothalamus undergo irreversible changes which result in prolonged coma.

(6) *The Increased Combustion of Protein Theory.*

Wortis and Lambert (1939) believe that certain of the manifestations of prolonged coma, such as the fever, can be attributed to an increased combustion of protein in the presence of impaired carbohydrate metabolism. It is difficult to see how this can happen in the case of the nervous system, which can use only carbohydrate in its metabolism.

(7) *The Deficiency of Tissue-essentials Theory.*

This holds that the condition is due to a tissue-deficiency of such essential substances in carbohydrate metabolism as vitamin B_1. The fact that patients developing prolonged coma do not apparently suffer from such deficiencies, that prolonged coma may not develop until the patient has already had many normal comas, and the absence of any response to vitamin B when the condition does occur are sufficient evidence against the theory.

Other theories, such as the too rapid increase in dosage, too profound or too prolonged coma, while of undoubted aetiological significance are not true theories as to the *cause* of prolonged coma, and they have already been considered in Subsection VI on aetiology.

Conclusions.

Summing up, it may be said that the cause of post-hypoglycaemic coma remains unknown, and will probably remain so until a great deal more is known about cellular respiration and the effect of hypoglycaemia upon it. All that is known at present are certain aetiological factors which influence the incidence of post-hypoglycaemic coma. These factors are :

(1) That the majority of prolonged comas occur in the first 14 days of treatment.

(2) That the *depth* of coma is important. If the duration of hypoglycaemia is kept constant, the more profound the hypoglycaemia becomes the greater the possibility of prolonged coma developing.

(3) That the *duration* of hypoglycaemia is important. Cases 1 and 2 reported in subsection V prove that even comparatively light stages of hypoglycaemia, if sufficiently prolonged, can result in prolonged coma.

(4) The prevention of prolonged coma is directly related to the skill and experience of the therapist. Post-coma confusion is a warning sign that the patient may develop prolonged coma on the following day, and patients developing such confusion should be given a few days'

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rest from treatment. Patients on hypoglycaemic treatment should be given fully adequate diets, including more than ordinarily sufficient amounts of vitamin B, as a relative deficiency of this vitamin may easily occur. This is the more important, as the increase in weight which usually accompanies the treatment may mask the presence of nutritional deficiencies.

SUMMARY.

This paper deals with the nervous complications of Sakel's treatment. The most important of these is post-hypoglycaemic coma. Two examples of this condition which followed light coma of long duration are described, and the aetiology, pathology, physiology, symptomatology, prognosis, treatment and theories of causation of the condition are discussed.

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POSTERIOR CUTS IN PREFRONTAL LEUCOTOMY: A CLINICO-PATHOLOGICAL STUDY.

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THE usual leucotomy cut in this country, made through burr holes orientated by means of skull measurements, in the majority of cases enters the brain at about the middle of pars triangularis of the inferior frontal gyrus (Brodmann's Area 45), and if performed in a strictly coronal plane remains entirely within the prefrontal region. Intentionally or unintentionally cuts are not infrequently placed either anterior or posterior to this plane. That cuts made posterior to strictly prefrontal levels are often followed by an unfavourable post-operative course distinguished by particularly severe personality change, persisting incontinence, vasomotor, trophic and neurological disturbances has been demonstrated by Knight (1943), Meyer and Beck (1945), Ziegler and Osgood (1945), Reitman (1946) and others.

Such posterior cuts usually involve the posterior orbital region, the striatum, the external capsule or the premotor region. Of these, the posterior orbital region has recently received special attention, particularly in American experimental work. It had long been known that after bilateral frontal lobectomy hypermotility might develop in monkeys, but it was left to Ruch and Shenkin (1943) to show that this occurred only when Area 13 of the posterior orbital region (delineated in the monkey's brain by Walker in 1940) was included in the lesions. This was confirmed by Fulton (1947) in monkeys, but not in a chimpanzee.* Richter and Hines (1938) and Mettler (1945), on the other hand, concluded that to produce spontaneous hyperactivity in monkeys the striatum in addition must be damaged.

Smith (1938) and Bailey and Sweet (1940) observed inhibition of respiration and gastric peristalsis after stimulation of a region roughly comparable to Area 13 in various species of animals, and Bailey and Bremer (1938) obtained abnormal electroencephalographic potentials from the same region in the cat upon stimulating the central end of the cut vagus nerve. Some of these findings have been confirmed, and amplified, by Delgado, Fulton and Livingstone (1947).

In view of these experimental results we have paid special attention to the posterior orbital region in the following analysis of the clinical and pathological data from our leucotomy material. It should be borne in mind, however,

* Fulton, in lectures in this country, recently described further interesting findings after electrical stimulation of the posterior orbital region in chimpanzees and man, but they have not yet been published and will not therefore be quoted in this paper.

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that in leucotomy the lesions are much less precise in their location than in cortical stimulation or ablation. For instance, a leucotomy cut which involves the head of the caudate nucleus is very likely at the same time to damage the premotor region or the posterior orbital region, either directly, or more remotely by severing their afferent and efferent fibres where they course out of and into the internal capsule. This imposes the need for particular care in the evaluation of our findings, and deters us from any too strict a statistical treatment of our tabulated data. Another limiting factor in our data is that in none of our cases had a scientific attempt been made to record the relevant symptoms before or after the operation. We are, thus, not in a position to make any statement on important indications of autonomic function, such as blood pressure, respiration, heat regulation, pupillary reaction, gastric motility, sweating, salivation, pilo-motor reaction, electrical skin resistance and psychogalvanic reflex. We have had to confine ourselves to some gross autonomic and other signs which we could be reasonably certain would not have been overlooked in the usual routine investigation. This, again, necessitates the greatest reserve in analysis and conclusions.

Out of a total of 60 leucotomy cases 40 were suitable for clinico-pathological study. Twenty-two were found to have in both hemispheres what in this paper will be called "posterior" cuts, i.e. they had involvement of the posterior half of the orbital region, the striatum, the premotor region (Areas 6 and 44 of Brodmann), the region of the external capsule (insular cortex, claustrum, capsula externa or extrema), or any combination of these. These 22 cases have been collected together in Table I. The regions involved in each case are indicated by plus signs within the appropriate columns, except in the case of the posterior orbital region, where further subdivision has been carried out into terms of involvement of medial, central and lateral thirds—this because Area 13 has not yet been defined in the human brain. In addition to columns for these four posterior regions we have included one for indication of involvement of the anterior half of the orbital region, for reasons to be mentioned. Other segments of the prefrontal region have been omitted, since they are not very relevant to our main theme.

The remaining 18 cases, that is to say the more truly prefrontal leucotomies, are collected together in Table II, and analysed in terms of involvement of the same regions.

On the right hand-sides of the Tables have been recorded the clinical sequelae reported in each case to have followed the operation. They have been distributed under five headings:

Personality change has been graded according to severity in terms of three degrees of plus, irrespective of whether the change was of the euphoric type or of the akinetic (torpid) type. Where the brevity of post-operative survival limited evaluation of the clinical observations the grading has been bracketed.

General restlessness is often included within the term "personality change," but we have given it separate mention, wherever reported, on account of the experimental evidence described above that its manifestation implies damage to a particular posterior region. It cannot, however, be compared directly with the restless pacing of experimental animals which Ruch and Shenkin

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regard as the characteristic result of bilateral damage to Area 13, for all our six patients displaying restlessness were confined to bed.

Vasomotor and trophic lesions.—These terms have been used to cover such symptoms as cyanosis of extremities, oedema and blisters of the skin.

Persisting incontinence of urine was taken to be positive when of over six weeks' duration.

Miscellaneous.—In this column "E" has been used to denote epilepsy developing for the first time after operation; "H" to mark the occurrence of hyperpyrexia as a prominent sequel; "N" to indicate the development of signs of nutritonal deficiency; "R" to denote marked respiratory disturbance; and "U" to indicate the appearance of uraemia. All purely neurological sequelae have been omitted.

The penultimate column shows the post-operative survival period; the last column those cases in which death can be attributed definitely to an intercurrent illness.

In spite of the shortcomings in the clinical data and the other limiting factors mentioned, not a few points of theoretical and practical interest can be derived from the tables.

In the first place, the contrast between the *general total of sequelae* in Tables I and II is most striking: 42 clinical items in the group of cases with posterior cuts, only 8 in the group with essentially prefrontal cuts.

A second striking point is that the *survival period* of the cases with posterior cuts is, on the average, much lower (6½ months) than the average of those in Table II (1½ years), especially if, as has been done in calculating the former average, one takes into account in Table I only the uppermost 17 cases, which had bilateral involvement of either the posterior orbital region or the striatum, or both. A third notable fact is that only one of the top 17 cases in Table I definitely died from an *intercurrent disease*, as against 10 of the 18 cases in Table II. Manifestly, therefore, posterior cuts, especially if they affect the striatum or posterior orbital region, tend to determine relatively early death, i.e. "*delayed post-operative death.*" Many of the "clinical sequelae" reported were undoubtedly either primary or precipitating lethal factors. In this connection it is interesting to recall that Heath, Freedman and Mettler (1947) found that after bilateral enucleation of striatal tissue in felines death always occurred within a few days, due, they thought, to upset of metabolic function.

The *personality change*, it can be seen, tends to be severest when the posterior lesions are most widespread. A mild degree of change was reported in three of the cases with the lesions confined to the prefrontal region, and it can safely be assumed that in other cases in Table II lesser degrees of change passed unrecorded. Hence personality change is not dependent upon, although amplified by, damage to posterior regions of the frontal lobes. This occurrence of personality change after lesions confined to the prefrontal regions proper is stressed (see also Meyer and McLardy, 1947), because it has recently been contended by Hebb (1945) that the personality is not affected by almost total removal of both prefrontal regions. That the personality change becomes more severe in posterior cuts may simply signify that the prefrontal connections have been more completely cut off.

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TABLE I.—*Bilateral "Posterior" Cuts.*

Case number.	Regions involved.										Clinical sequelae.					Survival.	Intercurrent cause of death.
	Posterior orbital.		Striatum.		Pre-motor.		Exteral capsule.		Anterior orbital.		Personality change.	General restlessness.	Vasomotor and trophic.	Persisting incontinence.	Miscellaneous.		
	L.	R.	L.	R.	L.	R.	L.	R.	L.	R.							
3	Lat. Cent.	Lat.	+	+	..		..		..		+	..	..	+	N	2 mth.	..
4	..		+	+	+	+	+	+	..		+++	+	+	+	U/N	4 mth.	..
10	Lat. Cent.	Lat. Cent.	..		..		..		..		++	..	+	..	N	3 yr.	..
11	Lat. Cent. Med.	Lat. Cent.	+	+	..		..		+		++	..	..	+	..	5 mth.	..
16	Lat.	Lat.	+	+	..		..		..		+	..	..	..	..	7 wk.	..
20	..		+	+	..		..		..		++	..	+	+	..	2½ yr.	+
22	Lat.		+	+	+	+	+	+	..		..	..	+	..	..	9 wk.	..
29	Lat. Cent. Med.	Lat. Cent. Med.	+	+	..		..		..		..	..	..	..	H	9 dy.	..
32	Lat. Cent.	Lat. Cent.	+	+	+	+	+	+	..		++	..	+	..	..	7 wk.	..
33	Lat. Cent.	Lat. Cent.	+		..		..		..		+++	+	+	+	..	10 wk.	..
38	Lat. Cent.	Lat. Cent.	..		..		..		+	+	+ +	+	..	+	..	..	1½ yr.
41	Lat. Cent.	Lat. Cent.	..		..		..		..		..	..	..	..	H	6 dy.	..
49	Lat.	Cent.	+		..		..			+	(++)	+	..	..	H	24 dy.	..
52	Lat.	Lat. Cent.	+	+	+	+	+		..		(+++)	+	..	..	..	20 dy.	..
56	Lat. Cent. Med.	Cent. Med.	+	+	+	+	+	+	..		+++	..	+	+	..	9 mth.	..
58	..		+	+	..		+		..		(++)	+	..	..	U	7 dy.	..
59	Lat. Cent.	Lat. Cent.	..		..		..		..		..	..	..	..	R	4 hr.	..
26	..		..		+	+	..		..		..	..	..	..	E	3¾ yr.	+
8	..		..		..		+	+	..		..	..	..	..	..	1¼ yr.	+
27	..		+		..		+	+	..		..	..	..	..	..	..	..
17	..		..	+	..		..		..		..	..	..	..	..	..	..

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TABLE II.—*Essentially Pre-frontal Cuts.*

Case number.	Regions involved.										Clinical sequelae.				Survival.	Intercurrent cause of death.
	Posterior orbital.		Striatum.		Pre-motor.		External capsule.		Anterior orbital.		Personality change.	General restlessness.	Vasomotor and trophic.	Persisting incontinence.	Miscellaneous.	
	L.	R.	L.	R.	L.	R.	L.	R.	L.	R.						
5	..		..	..	..	..	..		+	+	..	..	..	..	E	1½ yr.	..
18	..		..	..	..	..	..		+	+	+	..	..	..	..	1¼ yr.	+
19	..		..	..	..	..	..		+	+	+	..	..	..	..	6 mth.	+
34	..		..	..	..	..	..		+	+	..	..	..	..	..	2 yr.	..
44	..		..	..	..	..	..		+	+	..	..	..	..	..	3¾ yr.	+
57		Med.	..	..	..	..	..		+	+	++	..	..	..	..	2½ yr.	+
9	..		..	..	..	..	..			..	+	..	..	..	..	1¾ yr.	+
12	..		..	..	..	..	..		+		..	..	..	+	E	2 yr.	+
13	Lat.		+		..	..	..			+	..	..	..	..	N	7 wk.	..
14	..		..	..	..	..	..		+		..	..	..	..	..	8 mth.	..
21	..		..	..	..	..		+		..	..	..	..	..	..	1¾ yr.	..
31	..		..	..	..	..	..			..	..	..	..	..	..	1¼ yr.	+
35	..		..	..	..	..	..			..	..	..	..	..	..	1 yr.	..
36	..		..	..		+		+		..	..	..	..	..	..	2 yr.	..
39	..		..	..	..	..	..			..	..	..	..	..	..	1 yr.	+
46	..		..	..	..	..	..			..	..	..	..	..	..	9 mth.	+
60	..			+	..	..	..		+		..	..	..	..	..	3 yr.	..
61	Lat.		..	..	..	..	..			+	..	..	..	..	..	1¼ yr.	+

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Another conspicuous fact is that all cases displaying *general restlessness** all displaying *vasomotor or trophic lesions* and all displaying any of the "miscellaneous" sequelae except epilepsy, fall within the upper 17 cases of Table I, i.e. possess bilateral damage to either the posterior orbital region or the striatum or both, and often to the premotor region as well. A noteworthy corollary to this is that none of the six cases having bilateral involvement of only the anterior half of the orbital region shows any such sequel, beyond personality change. This would indicate that in man, as in animals, the mechanism concerned in the production of these clinical changes, so far as related to the orbital region, is confined to its posterior half. The central third is, by direct homology, the most likely to correspond to Area 13 of monkeys. Fulton, however, has suggested that perhaps in chimpanzees and man Area 13 is more widespread. Final settlement of the matter will depend upon exact delineation of the area in the human brain by architectonic studies.

It should be mentioned here in passing that although evidence is accumulating that the cingulate region may have important autonomic functions (McCulloch, 1944; Smith, 1945; Kremer, 1947), the involvement of the anterior cingulate region in our material was about equally distributed between cases falling into the top 17 of Table I and those of Table II. Hence damage to this area (Brodmann's Area 24) has apparently no causal connection with at least the rather gross types of clinical manifestations to which our report is limited.

That the four cases having bilateral posterior lesions confined to the external capsule (the bottom group of Table I) display no sequelae whatsoever indicates clearly that the anatomical substrate concerned in these undesirable clinical changes does not include the external capsule, claustrum, extreme capsule or insular cortex (or, it should be added, the uncinate fasciculus, which was bilaterally involved in at least three of these four cases). The other three posterior regions, however, cannot be dealt with in isolation, for lesions in the region of the head of the caudate nucleus are extremely liable to damage fibres there which are projecting to and from premotor or orbital cortex. The four cases of bilateral striatal damage without direct posterior orbital lesion show no significant difference in incidence of general restlessness and vasomotor or trophic lesions from the six with bilateral posterior orbital damage but no striatal involvement. Fulton, Livingstone and Davis (1947) have, in fact, suggested that fibres projecting to Area 13 pass through the caudate nucleus. This would, to some extent at least, reconcile the views of Richter and Hines and Mettler (who relate restlessness to striatal damage), and of Ruch and Shenkin (who relate it to posterior orbital damage).

With regard to vasomotor and trophic disturbances, it will be recalled that Kennard (1935) created vasomotor changes in monkeys by ablation of the premotor area, and that in Ziegler and Osgood's leucotomy cases displaying vasomotor and trophic phenomena there seemed to be some relationship with posterior cuts, as determined by contrast radiography.

Persisting incontinence of urine is a very general symptom which cannot

* In a previous communication (1948) based on a smaller number of cases a more reserved statement was made on this point.

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be expected to correlate closely with damage to any circumscribed region, for although it is well known to be brought about by lesions of the dorsal part of the premotor region, it may, on the other hand, be determined simply by the general deterioration in a patient's conduct—and, in fact, all but one (No. 38) of our nine cases exhibiting it either had lesions likely to affect fibres from the dorsal premotor region or showed post-operative mental deterioration.

The "*miscellaneous*" *sequelae* are too few to warrant full discussion at present. It is interesting, however, that of the three cases developing *epilepsy*, the two in which it commenced within a few months had the most anteriorly placed cuts in our series. The third case (No. 26) had posterior cuts, but here the epilepsy bore a somewhat doubtful relationship to the operation (since it did not commence until two years later, and two courses of E.C.T. had been given in the meantime). A fourth case, mentioned in a previous communication (1948), has been omitted from the present series because of the discovery of an independent organic disease of the brain which complicates the picture. A fifth case (not included in the present series) has only just been received which shows the combination again of post-operative epilepsy and an unusually anterior lesion on at least one side. The damaged anterior regions peculiar to these three cases lie definitely rostral to any of the sites which Russell (1947) has tentatively related to post-traumatic epilepsy. They remind one more of Pennybacker's (1945) series of cases of abscess of the anterior pole with epilepsy. Our cases, however, are still too few and incompletely investigated to warrant further discussion at present.

Nutritional deficiency took the form of pellagrous symptoms in two cases, Wernicke syndrome in one case and vitamin C-like deficiency symptoms in a fourth. It is difficult to determine what the causes, extrinsic or intrinsic, of this nutritional deficiency may be in these patients, and in view of the complexity of the whole problem of nutritonal deficiency it would be idle to speculate.

The three cases displaying *hyperpyrexia* revealed no histological evidence of infection of the brain or meninges. They had in common only bilateral damage of the posterior orbital region.

It is difficult to say whether the *uraemia* which developed after operation in Cases 4 and 58 had anything to do with the damage to the brain, but it has been recorded in view of Cumings' (1942) findings in cases of head injury.

The one case of marked *respiratory disturbance* (No. 59) merits special attention in view of the bearing which experimental findings may have in its interpretation. Because the patient was suffering from impetigo of the scalp 100,000 units of pure penicillin were run into each of the leucotomy wounds at the time of operation. The anaesthesia was without incident, but very shortly after recovery from it the patient showed left-sided twitching, and his respiration was noted to have become alarmingly slow and irregular. Artificial respiration and oxygen were administered repeatedly. Twitching continued at intervals. Two hours after the operation the respiratory rate became 30 per minute, and a quarter hour later the patient developed a first major epileptic fit. Fits recurred at 5-minute intervals and were not fully controlled by intramuscular gardenal, being reduced to one per half hour. Respiration

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again became irregular but deep, and in spite of further gardenal and coramine injections the patient died during his eleventh fit, four hours after return from the operating theatre. Diagrams 1 and 2 indicate the position and extent of the cuts. The interpretation of the symptoms is not simple, on account of the known epileptogenic effect of penicillin in contact with the C.N.S. (Johnson, Walker, Case and Kollross, 1946). The respiratory effects were so primary—long before major epileptic fits developed—that one is led to postulate a double aetiology for the symptoms, attributing the respiratory disturbance to the bilateral damage of the posterior orbital region, the site of the lesions which Bailey and Sweet and Delgado, Fulton and Livingstone found to produce respiratory inhibition in animals.

That other cases with bilateral involvement of the posterior orbital region did not display such respiratory disturbance—or, for that matter, the fact that all cases with similar lesions did not display identical sequelae—does not necessarily invalidate the positive correlations which have been pointed out. Quite apart from the possibility of constitutional variation in the homeostatic mechanism of different individuals, it may well be that grossly similar lesions differ in details which we have not yet distinguished, but which may determine differences in the nature of the upset of physiological balance. We have, actually, examined other variables than these discussed in this paper—e.g. involvement of the ventricles, damage to fasciculus subcallosus, affection of grey as well as merely white matter of Brodmann areas—but have found no correlation trend.

The anatomical pathways concerned in these post-operative autonomic and other changes remain obscure. Only one of the many postulated cortical connections of the hypothalamus has been definitely established—namely, the connection with the orbital cortex by way of unmyelinated periventricular fibres which relay in the magnocellular part of the dorsomedial nucleus of the thalamus. The present writers, together with E. Beck (1947), previously described some histological evidence that the medial part of the anterior half of the orbital region connects with the anterior part of pars magnocellularis of the dorsomedial nucleus. Further histological investigation is necessary, and is in progress in this laboratory, to determine the precise thalamic, or other, connections of the posterior orbital region.

Summary.

Clinico-pathological analysis is made of 40 cases of prefrontal leucotomy, with particular reference to the relation of restlessness and certain autonomic disturbances to the posterior orbital region. The results emphasize the potentialities of such studies and the importance of full clinical investigation of cases before and after operation and their eventual correlation with the pathological findings.

Acknowledgments.

We wish to acknowledge our gratefulness to all those who contributed the clinical records and brain material utilized in this study, and in particular, to

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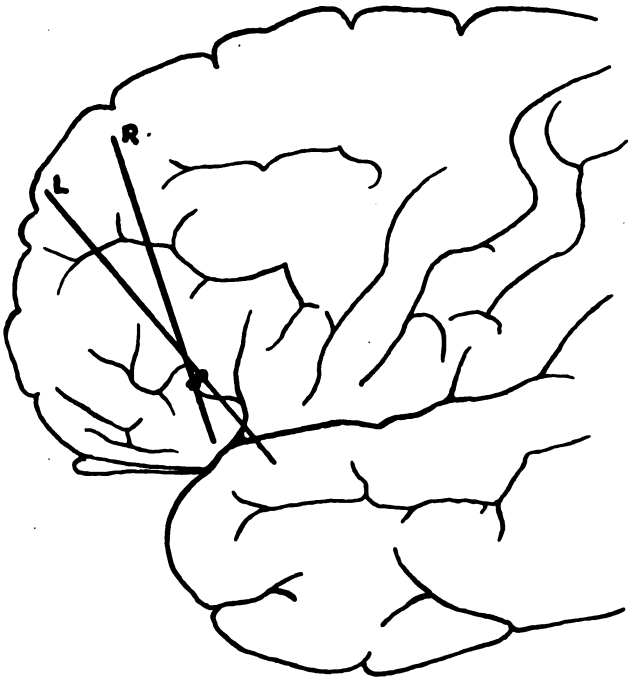

FIG. 1 (Case No. 59).—Showing the plane of the leucotomy cut in left and right hemispheres.

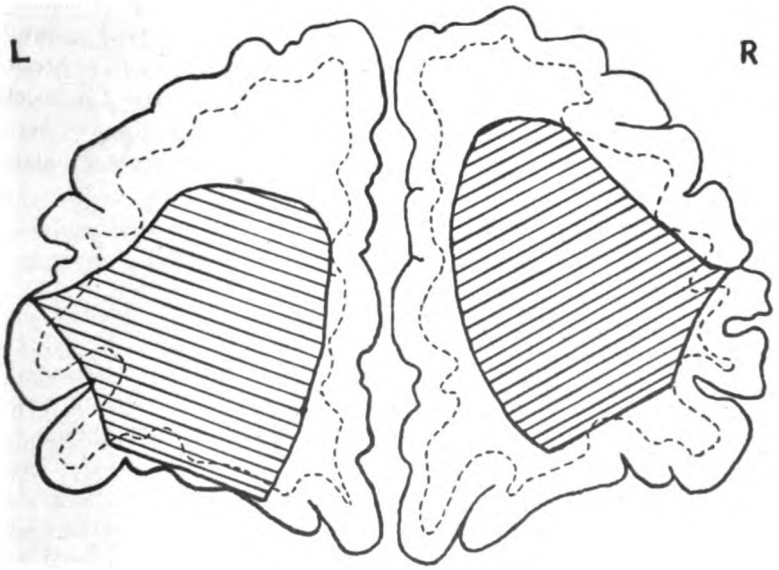

FIG. 2. (Case No. 59).—Showing the extent of involvement of the white matter and cortex in the two frontal lobes.

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thank the Superintendent and the Clinical Director of the Crichton Royal, Dumfries, for permission to mention the more fully described case of post-operative respiratory failure.

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A PSYCHIATRIC REVIEW OF FIFTY CASES OF GUNSHOT WOUNDS SELF-INFLICTED.

By R. F. FIDLER, M.B., B.S., D.P.H.

MY interest in this subject was aroused during the first few weeks of the campaign in Normandy, when seemingly large numbers of these cases were known to be undergoing surgical treatment. At that time the rapid flow of psychiatric cases prevented a clear view of the significance of the situation as it was impossible to know accurately whether these wounded were in high proportion to the number of troops in action or to the total of battle casualties.

I recall that only once was I asked to see any patient with clinical anxiety among the first hundred self-inflicted wounds under treatment in a neighbouring hospital for whose psychiatric work I was responsible; this one case I saw had an exaggeration of the very natural fear of being shot after the expected result of his court martial; he was fairly easily persuaded to face his responsibilities and did not behave like a marked psychopath.

Three months after D-day I took an opportunity of examining 50 cases at a holding unit in the hope of distinguishing accidental from deliberate injuries in battle-strained men by psychiatric criteria as compared with the results of more purely military consideration. The cases were unselected and had been charged with "neglect in the use of weapons," and all convictions were in those terms; the usual decision had been taken as to whether the wounding was consistent with a missile from the man's own weapon; 29 had been sentenced and 21 awaited trial.

The cases were first seen by their Medical Officer during his regular examinations for a graded physical training course; they were then reviewed psychiatrically and a report sent to a medical board for any recategorization to take effect after completion of any sentence. My records included details of childhood and adolescent health, a social history and estimate of any pre-service neurosis, response to service training and stress together with an account of the injury without access to previous records; there was no question of extracting confessions from these men.

I. ACCIDENTAL.

The interpretation of the stories and psychiatric histories of 22 of these men was, in my opinion, that of accidental injury. Two foot injuries arose from handling Sten guns; two occurred during demonstrations to mates of captured revolvers and the remainder during cleaning of rifles with resultant injuries mostly to one or other foot and less commonly the left hand or forearm.

There were 10 "reasonably stable persons" whose ages varied more widely than did those in any other group; they were from 19–38. The accounts of four of these accidents are found in the appendix; the first two, A— and

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B—, had had more than two years' good service and had been through average battle stress without neurosis. The other two cases quoted, C— and D—, were both under 20 years of age and handicapped by psychological immaturity as well, and this was typical of the remaining group of 12 in this accidental series; only one of whom was over 21. I have no doubt they were in a mild anxiety state at the time of their injuries after experiencing rather more than average battle stress, but the earlier histories of a few cases showed a type of mild constitutional psychopathy making them "accident prone." No more precise diagnosis than psychopathic personality (with emotional abnormality) was possible. The "reasonably stable" were left in Medical Category A on psychiatric grounds; roughly half the unstable were placed in Category B and half in C.

It will be seen from a perusal of these examples that some of these accidents are preventable by routine inquiry into the psychiatric history of the men, if undertaken during their first few days in the General Service Corps; intelligence and manual dexterity and other testing identifies gross cases of "accident-prone" persons. Suitable postings can prove prophylactic in the same way as driving accidents are to some extent prevented by postings away from such duties after tests. There are, however, bound to be cases that elude this net and in whom mild personality defects become more obvious during the cumulative fatigue and anxieties of battle and in whom, therefore, accidents occur. Personnel of the B.L.A. were fully tested before D day, but large scale changes in employment were impracticable. Improvements in the Sten gun were made soon after D day in view of these accidents.

II. Deliberate.

The five confessedly deliberate cases are quoted here in full:

Private E— sustained a fracture of the proximal phalanx of the left great toe, 19.vii.44, 1½ years after conscription at the age of 18½. He had become a Rifleman after satisfactory weapon training and settled down well with pre-service friends in a good and well-known Infantry unit mostly drawn from the same city as himself. He landed in Normandy on D plus 4 and had very little rest for five weeks, but he "got on alright," though several pals were lost. He stated that he "would not move from his trench during the last four days before he shot himself." He added that he saw others do this, but hesitated, and then having shot his foot he "felt foolish and did not like leaving his trench mates afterwards."

At the time of my seeing him two months later he had progressed well surgically and he was satisfactorily employed in the cookhouse, but he himself considered this too inactive despite incapacity from a foot-plaster; he genuinely wished to return to full duty. He had informed his parents he had had an accident.

The earlier history was of healthy stock, one brother doing well in the Army and another a medical instrument maker, but another brother died nine months old with "fits"! After reaching the top standard of an elementary school he fulfilled his desire to become a butcher by apprenticeship, and liked the active life, attended sales, etc., with a cousin by whom he was employed. He had plenty of general interests and had a girl friend.

One's impression was of a good personality not suffering from any excess of remorse at the time of my seeing him; he was making the best of things and realized that in camp the conditions were relatively easy. He received a sentence of two years' hard labour and this, in my view, would not lead in his case to deterioration in personality and diminution of his capacity as a soldier; I recommended a change in category on psychiatric grounds.

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Private F— fractured the neck of his third metatarsal, 9.vii.44, 1½ years after conscription at the age of 18. He described how he "got on alright" and made friends in an Infantry unit for nine months and was then transferred to his present unit, where he did not find he fitted quite so well. He took part in the second assault on D-day, ¾ hours after H-hour, but this was "moderately uneventful" even though he lost most of his pals that day; his unit moved forward continually until, on a general order to clean rifles, he was sitting outside his slit trench with the weapon across his knees; he describes his pulling the trigger quite clearly. His attitude at the time I saw him was mildly insolent and he had no regrets.

The earlier history was of his father's dying when he was 10 with the almost inevitable dependence on his mother, whom he had informed of this injury in truthful terms, and in reply he was told he "was stupid"; there were three brothers—one in the R.A.F., but the other two of unknown activity; he had "never taken any interest in them"; he himself lived with friends in the same county as his mother; he had had a girl friend, but they quarrelled and parted. He reached one standard from the top of an ordinary elementary school and became a carpenter's apprentice for three years but gave it up and became a lorry driver.

The general impression was of a poor, immature personality of schizoid type, though of average intelligence. His attitude to his 12 months' detention was not remorseful, he was sullen and disliked being employed in any form; his injury was improving at an average rate. Medical Category C was recommended.

Private G— produced a comminuted fracture of the proximal phalanx of his right foot, 4.vii.44, by a shot from his rifle. He had volunteered at the age of 18, 8.xii.42, "because everybody else seemed to be in the Army"; he was placed in the infantry but would have preferred R.A. as "you seem to get better treated there."

He took part in the 2nd assault on D day at 9.30 a.m. and his unit was active for four weeks with two 4-day rests; he disliked mortaring more than going into an attack, but on this last action he described how he had the safety catch of his rifle forward and how he "then felt nervous, found his foot stung and that he had a hole in his boot." He mentioned that he felt off his food for 48 hours before this and that "more than likely he pulled the trigger."

The earlier history was of leaving the top form of an elementary school at the age of 14, but went to a doctor for his "nerves"—he was "full of funny ideas that he lost in the Army." The parents sound stable, but were concerned about their son's situation to a natural extent; there was one healthy sister, no girl friend, but several pals some of whom he had heard were killed in Normandy; his job was that of a lathe operator and he was a boxer.

The general impression was that of a youth somewhat duller than his educational attainment might suggest and more immature even than his age would warrant; he thought he would be greeted with enthusiasm on return home after completion of sentence. The case had been adjourned owing to failure of witnesses. In view of his psychiatric handicap I did not consider that punishment would improve his capacity as a soldier and recommended Category B.

Private H— fractured the 1st, 2nd and 3rd cuneiform bones of his left foot by a rifle shot, 9.viii.44. He had volunteered for the Army at the age of 18 and had served 4 years as a cook the whole time. He declared he had had no infantry training and had not handled weapons because the battalion had just returned from abroad at the end of May, 1944, and "all courses had been stopped." After no embarkation leave he had served three weeks in the line out of two months in Normandy and felt "nervy all the time." He said he had been on guard and "it wasn't an accident really."

The earlier history was that his father died when he was 5 and as his mother committed suicide when he was 14 he went to live with an aunt. He attended an elementary school, but was sent to a convalescent home at the age of 11 "for nerves," but he returned to finish at his ordinary school at the age of 14; he left from the bottom form, but he was under the impression he "had made up for it since"—he could only just read and was still excessively afraid of the dark. He had been employed by several different firms as a polisher and in each had had accidents, none of which was seriously disabling, but he was dismissed from each because of this. There were two brothers; one was burnt in an Army tank, but recovered after treatment; the other was doing well in the Police force.

This man gave the impression of being a dull, inadequate personality with a

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bad background, but he was coping with his environment as well as he could ; I did not think that punishment would make him a better soldier; I recommended Category C, but his case had not yet come before the Court.

Rifleman I—, after 10 months' service from the age of 18, had wounded his left foot, 12.vii.44, with a rifle shot. He had been 3½ weeks in the line and had had a gradual onset of nervousness and felt " shut in " whilst in a trench ; he had been experiencing battle dreams and was upset at seeing and attending to casualties ; he had had no mail from home since being in Normandy and he had wandered away once but gave himself up ; he was rather vaguer than most of the 50 cases as to details of his movements in France. During cleaning his rifle he described how he had an uncontrollable impulse to injure himself.

The earlier history was of conscription during November, 1943, but he did not recall the date without verification from A.B. 64 as the 18th ; he disliked the six weeks' preliminary training because it " made you feel you haven't a mind of your own " ; then after ten weeks' infantry training he attended a signals course with poor result and after that a " hardening course." He proceeded to Normandy " sometime in July " and thinks he was four weeks in the line as a runner ; he saw his two pals mutilated, and his description of response to the call for first aid was that of more than average fear.

The background was of the father a Chief Clerk to the D.C.R.E. ; a happy home of three brothers, the eldest to Consular service after Cantab. ; the second, a mortarman instructor who had never been in action, " thank goodness," according to my examinee, the youngest of the four ; the third brother had been in the Army, but discharged for some condition not identifiable from this man's description. He left an elementary school from the top form and was happy there ; he became a clerk but made five changes in four years without any definite reason and had suffered from a compulsive desire to throw himself off bridges. At the time of my examining him he was irrationally fearful of returning to his unit ; he considered the condition of his foot would not prevent his being sent and had no idea that S.I.W. had solved his problems even temporarily ; he found he had not the courage to inform his family other than in terms of accidental injury.

The impression he gave me was of a poor personality of schizoid type on whom I considered the effect of punishment would be negative. He confessed to a deliberate action during his 90 days' field punishment given for " negligence in handling a rifle." I recommended Medical Category C.

It is notable from this group that none had been evacuated earlier in the campaign for battle exhaustion ; from their stories it is likely that they were so suffering at the time of their incidents. One was surprised at the variation in the degree of psychopathy that seemed necessary to produce these acts. The first case was an average personality but the others showed deviations. This small clear-cut group were all young and psychologically immature and not readily diagnosable by set labels indicating particular types of neurosis; none was near any dangerous state of depression at the time of his incident; the nearest label for administrative convenience was " psychopathic personality with emotional abnormality."

These service findings are striking contrast to civilian experience of the gross degree of constitutional psychopathy in hysteric form that one usually associates with such lesions as dermatitis artefacta. On the general principle that battle neuroses are the result of the interplay of constitutional and environmental factors in childhood with later stress, any interpretation of these five deliberate S.I.W. cases is that the latter factor predominated rather more than it does in any unselected series of neuroses from the field. Had they been more handicapped by a greater degree of constitutional predisposition to neurosis their training stress would have eliminated some of them from the risk of

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battle stress; if they had been in any appreciable action they would have broken down earlier and appeared at Field Dressing Station level of evacuation.

They were, to a considerable extent, comparable in type of psychopathy to any series of immature deserters from equivalent battle stress but, on the other hand, they had coped with their innate handicap better and displayed greater stamina in that they faced the possibility of an immediately painful result of their acts more consciously than does the hysteric wanderer who is often near a fugue state at the time of desertion. The prognosis, however, was not as good as their comparatively slight psychiatric handicap suggested; their chance of return to full duty was slight quite apart from any residual disablement from their injuries. The delay from surgical and legal necessities tended to prolong any neurosis, especially as really useful occupations had been difficult to organize; the outlook was nearly as bad as that of some soldiers not markedly psychopathic but lightly wounded by enemy action, who had spent three to four months in general hospitals in Great Britian but who broke down within three weeks of return to action.

Even though some of the statistical evidence may never become available, I think it is fair to compare these cases with the impressions gained from the various administrative levels at which battle neuroses were dealt with in the B.L.A.; when their proportion rose during the mounting total of surgical casualties the number of neuroses never became really serious and at the same time neither did the self-inflicted wounds become a serious problem. It would be somewhat difficult to prove satistically whether these cases were more common in the B.L.A. than during 1914–18 or *vice versa*; it is possible that some of our neuroses treated from June, 1944, onwards would have been self-inflicted wounds if they had served in the 1914–18 War, because then the death penalty for desertion was current and clearly enunciated.

III. Doubtfully Accidental.

There were 23 men whose military situation was more difficult to define from assessment of their stories even in the light of their psychiatric histories, hence their interest was as much medico-legal as clinical. Descriptions of four of these cases (J— to M—) are found in the appendix.

The general impression one received from their stories and their attitude to detention and their future was, on the whole, consistent with their backgrounds. Many were resentful at being punished for acts they considered not their own fault, and this seemed to be genuine rather than a cover for guilt in many cases; only a few of the more psychopathic "protested too much"; most were thankful at not being available for full duty again, but this did not seem to me outside normality. A few of the more doubtful stories indicated the possibility of deliberate acts, especially in view of the psychiatric histories; the lack of ability to confess was consistent with the degree of psychopathy; there were a few, however, whose lack of confession was probably in order to prevent an increase in anxiety that had arisen from the difficult domestic situations. These latter cases were older men who from that factor alone would be more likely to be thus handicapped quite apart from any inherent

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psychopathy ; 7 of these 23 men were over 30, with an average of two years' service. In a few instances quite markedly handicapped men had survived surprisingly more than average battle stress before finding themselves in a position of temptation to self-mutilation, yet such could not be proven to have occurred from legal or medical evidence : cases J— and K— illustrate some of these points.

The age range was 19–34, five of them being under 21, with mild psychopathy similar to that of the five deliberate cases, but the incidents occurred whilst the men were cleaning rifles at rest, as did all but two of this group ; these two were chronic mild hysterics, aged 29 and 32, one of whom had 7 years' service, mostly as mess orderly ; then incidents occurred during action whilst they were in a condition approximating to a fugue. No other hysteric manifestations were found such as palsies complicating wounds. I was able to place only two in a medical category higher than C, and they were the only ones in which I could say that punishment might be beneficial.

There were 8 dull and backward men, whose instability was of a type commonly associated therewith ; their incidents occurred under field conditions less exacting than any other group, they were both more liable to accidents and to deliberate injury because of double handicap. The first case shows how repeated postings was a stress to which this type is particularly liable and vulnerable ; the second man was, on the other hand, among friends all the time but was more handicapped by innate defect. All these 8 were more depressed than others in the camp ; in none did I recommend a higher category than C. It is of interest that they were in higher proportion to the normal 10 per cent. or so usually found amongst any unselected recruits during routine examination in the General Service Corps.

The difficulties of standardization of individual responsibility above the level of the obvious psychotic are only too well-known in civilian practice. The use of psychiatric reports on military crimes has been found to confirm civilian figures ; about 2 per 1,000 examined can be deemed irresponsible from psychosis ; no psychotic cases appeared in this series owing to immediate segregation in special hospitals.

These 50 cases are summarized by tabulation as below :

	Sentenced.	Not sentenced.	Total.
I. *Accidental :*			
(1) Occurring in reasonably stable persons	5	5	10
(2) Occurring in unstable personalities	8	4	12
II. *Deliberate*	3	2	5
III. *Doubtfully accidental :*			
(1) Occurring in unstable personalities	9	6	15
(2) Occurring in dullards with associated instability	4	4	8
	29	21	50

I placed 12 unstable personalities in Group I (2), owing to a considerable degree of inherent psychopathy, and took extra care over their stories of wound-

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ing, because one would naturally expect to find greater difficulty in interpreting their military situation. Absence of witnesses was the cause of delay in sentence of the five "reasonably stable persons" in Group I (1) and to a very great extent this was inevitable at that stage of the campaign; the fact that so many fall into this group might suggest a greater degree of responsibility than "accidental injury," but the evidence as a whole does not, I think, support such a contention. It seems to me fair to say that even if the 23 "doubtfully accidental" wounds could have been proved deliberate this would still leave 22 "Accidental" that would then stand out perhaps in somewhat false contrast; at any rate, whatever figures might result from differing examiners with extra or predominantly legal or medical outlook, there is, to my mind, a not negligible proportion of accidents with weapons among these soldiers.

Summary.

1. Most cases of self-inflicted wounds whether deliberate or accidental in men from battle areas are early cases of exhaustion neurosis.

2. S.I.W.'s are uncommon relative to total casualites and also to other types of neurosis under field conditions.

3. Few of them can easily be proven to be deliberate, and those that are so are drawn from similar psychiatric material compared with the variations one meets in unselected cases of battle neuroses; they were immature youngsters, genuinely exhausted.

Review of Literature.

American writers tend to equate S.I.W. with malingering. Bishop (1) defines the self-inflicted injury as "hurt of any part of the body whereby he is rendered less able in fighting either to defend himself or annoy his adversary." Clark, in the same publication, adds that criminal acts of this type do not include those that disfigure, such as cutting off the nose.

The incidence amongst conscripts in the U.S.A. was considered high enough for special instructions to be issued to Recruiting Boards reminding them to keep a watch for these cases (2). Bruinewitsch (3), early in 1939, found a wide variety of ruses to avoid military duty and considered them to be common; he described various chemical burns and even very unintelligent damage to the skin to represent through and through chest wounds; none of these can be classed as occurring after military stress.

Civilian experience is quoted from 14 cases of dermatitis artefacta by D. Hart and R. Jones (4): these occurred among young women of subnormal intellect and cases in men were more clearly related to sexual perversions of masochistic tendencies.

The only writer describing any case in a military setting was D. J. Flicker (5). He was attempting to provide a court martial with a report on a soldier on Home Service who, after moderate prompting, was able to recall details of placing his hand under a passing railway train in order to get leave to go home; this had neither been requested nor refused; examination showed him to be of intelligence corresponding to a mental age of 13 and showed

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general psychological immaturity of hysteric form. The psychiatrist did not feel confident in recommending prosecution for malingering; the report was rendered to term of "no psychosis." In this paper he quotes Emanuel Miller as implying that S.I.W.'s were common in the 1914–18 War by wording "entire hospital wards were filled with men who had been shot in one finger or one toe. No one will ever know fully how many of these were self-inflicted injuries, although medical officers then on duty believe the number to run into thousands."

Perusal of Emanuel Miller's book itself (6) shows a review of the literature of war psychiatry to 1940; there are exceptionally few references to the subject of S.I.W.'s and the author quotes none. He mentions his own clinical experience of a tented field hospital where the instability of S.I.W. cases was as great as that of "shell shock" cases (as battle neuroses were then called); he considered the former to be in the prodromal phases of neurosis, the patient being in a state of pathological dissociation when the attempt was made.

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Appendix.

I. (1) Accidental wounds occurring in reasonably stable persons.

Sergeant A—, aged 29, with 4½ years' good service as infantryman, was sent overseas with the B.L.A., D plus 8, and reached a forward area 14 days later. He had three spells there totalling three weeks and declares that he "got on alright" and was promoted to sergeant; this was not wholly explained by the fact that two battalions had to be merged owing to casualties during a break-through at the end of August. He, like many of his mates, acquired a German revolver about which he fancied he knew something. He was demonstrating this by pulling it apart; it went off and wounded his left hand, leaving him with a fractured neck of the second metatarsal; he was right handed. The earlier history was good psychiatrically; he had an average result at an elementary school followed by progressive employment. He came from a healthy family with a brother on service in Burma and a sister in the Q.A.I.M.N.S. Marriage was successful, with two children. His morale was good and his attitude to his military situation sensible.

Private B—, aged 27, with 4½ years' good service all in the same infantry unit, had enjoyed his six weeks' period of training. He had been in Normandy since D plus 16, at Caen and Falaise, but had "got browned off owing to mortaring and night work." He described a "routine job" of cleaning his rifle at 6 p.m. after having been on guard at night, unable to sleep in the day-time and had been up since 4 p.m.; he was talking to his mate 5 ft. away when "there must have been a round in the breach, unknown." He declared credibly that he had "always been very careful." He was of a large healthy family—this member had an unlucky marriage, but he had the stamina to cope with it well and could not be said to have

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neurosis associated therewith ; his work had been that of gardener after average elementary school curriculum. I considered he was in a very mild anxiety state at the time of the incident but this had passed. His morale at the time of examination was good.

I. (2) Accidental wounds occurring in unstable personalities.

Rifleman C—, aged 21, with 4 years' service, had volunteered 11.xi.40, because of unemployment. He was under the impression that he had acquired weapon training satisfactorily. He took part in the second assault on D day and later was stationed just outside Caen for a month. He was given a Sten gun on being promoted to No. 1 on the mortars. He declared that he had never used this weapon before and was cleaning it across his knees when it exploded and wounded his left forearm extensively. His origin was from exceptionally poverty-stricken location with an unhappy family background ; employment had always been irregular and of low grade ; he was below average in intelligence and unstable in addition, yet he was not unduly strained by battle ; the story was consistent with a highly accident-prone person.

Private D— smashed his proximal interphalangeal joint of the 2nd left toe from a rifle wound, after 1½ years' conscripted service from the age of 18½. He had been in several infantry units but managed to make friends ; he had been trained in a beach group and landed in Normandy with the first assault troops on D day and remained on the beaches for two months, unloading craft. Then, after a few days in two attacks in the line, he felt nervous " after plenty of shell fire " and then lost his pal and " didn't know if his nerves went." He did not see his M.O. and continued in action for a week ; one day he was outside his trench cleaning his rifle when he was obliged to get back owing to mortaring but got out again to finish the cleaning, " it went off during the final rub over." He did not know how it happened, " he did not remember pulling the trigger."

The earlier history was of the death of his mother when he was three, with the not uncommon failure of the substitute and early marriage "to get away from home." This had been satisfactory judging from the man's letters home, but he felt unable to contradict the local paper's account of his having been " wounded in action." There had been an average result at an elementary school and fair work record ; the impression was that of a person mildly handicapped by constitutional psychiatric defect ; his morale was fair considering this ; he expected to break down if he ever became fit surgically for Category A duties but looked forward to doing his best should he be made a driver ; he showed some skill at maintenance work. I did not think that punishment would necessarily improve his capacity as a soldeir. I recommended Category B.

III. (1) Doubtfully accidental wounds occurring in unstable personalities of average intelligence.

Private J—, aged 34, with 1 year 9 months' service, was conscripted 19.xi.42, after volunteering in 1941, but was not accepted because he was a foreman joiner in an Ordnance factory. He received 14 weeks' infantry training but was then placed in the cookhouse because of loss of the left forefinger in civil life ; this had proved a difficulty with the rifle. In Normandy from D plus 7 he was a cook in a holding unit for a month and then a reinforcement to a well-known infantry unit, but he did not experience strain over more than a few days and he was due out of the line the next day, he stated. His story of the wounding of his left foot was that there was difficulty in getting the pull-through out of its container in the butt ; the opening had become stuck. He used a tin-opener with the rifle upside down on his foot—the " usual position to do this " and " something caught " ; he added " somebody must have borrowed it and left it loaded." He sustained a compound fracture of the proximal phalanx of the 2nd toe. The civilian history is that he has been married 12 years and had requested welfare investigation of his wife's alleged infidelity at the time of the incident ; he was taking his troubled circumstances well. He described himself as always having been a nervous type excessively afraid of the dark and of strangers ; he found he was happier making drawings in his spare time even though he was engaged on joiner's work all day. He was an inadequate personality that could have been equally capable of a clumsy accident as of more than " negligence in the use of weapons." I recommended Category C, on psychiatric grounds.

Private K—, aged 31, with three year's service, wounded his left foot with a shot from his rifle, causing a fracture of the 2nd and 3rd metatarsals. He had

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been conscripted 26.vii.40, and placed in a well-known infantry unit but did little beyond driving duties. At this time his wife was twice "bombed out" with the result that he deserted for a year and was duly punished. He went to Normandy 1.vii.44, and after being in reserve for a fortnight spent a week in a forward area, when he stated that having cleaned his rifle he was sitting down with the barrel facing downwards, chatting to a mate—"It just went off; did not know whether it was hand or rifle." He explained that he was feeling disgruntled at the time about not having had embarkation leave. The earlier history was somewhat erratic; he was backward at school which he explained as due to "general circumstances of his home." The background sounded very unhelpful, but this is not wholly the explanation of his neurotic tendencies. He failed to complete an apprenticeship at electrical engineering after 18 months and drifted into casual labourer's work in building. It seems to me that had this man not had this questionable accident he would have turned up with some other form of psychopathy, absence without leave or a hospital neurosis case. I recommended Category C.

III. (2) Doubtfully accidental wounds occurring in dullards with associated instability.

Private L—, aged 22, with 11 months' service, had been conscripted 4.xi.43, and had like his infantry training and appears to have done reasonably well on weapon training and with the B.L.A. from D plus 10. He appears to have had an easy time for the first few days but was transferred to another unit that ran into a difficult patch under mortar fire—there were some desertions from the unit. He then had two days' rest and was transferred to yet another unit and had been in action all day, had had no sleep the night before the accident, and whilst cleaning a rifle he described how he "pulled the trigger, having the rifle brush in the same hand with the weapon across his leg"; he added "there must have been a bullet up the breech." He sustaind a wound of the left foot with a compound fracture of the head of the 1st metatarsal. He was depressed at the time of this description —three months after the injury—and it is likely that he was of as poor morale then as at the time of the injury. The earlier history is that despite regular attendance at an elementary school he left at 14 half way up the school and illiterate. He followed a family tradition of entering a coal mine, but was found to be unfit for underground work owing to tachycardia, so he left in August, 1943, to work in an aluminium factory and got on alright there. There were two brothers of better intelligence, one on a farm and the other in a factory. He had always been exceptionally shy and one's impression was that this was an immature dull youth of the type more likely to be tempted to semi-conscious evasion of the strain of forward areas; he was also accident prone from his low intelligence so that an opinion on the possibility of deliberate injury could be no more certain than that already provided by the Army legal arrangements. Category C was recommended.

Private M—, aged 20, with 18 months' service, injured his left foot with a rifle shot, causing a compound fracture of the medial and external cuneiform bones. He had volunteered for the Army 3.xii.42 "because his mates had joined," he was vague as to how he had got on during infantry training, but he had settled in the regiment to which he was posted because he had met mates from his home town. He took part in the second assault on D day and then was part of a beach group unloading under fire for a month; later he moved about a good deal without being in action. He was cleaning his rifle "because it was raining, but had been told to keep it loaded for a break-through." He gave a slow description of taking the magazine out and of putting the rifle on the bank at the side of the trench in order to facilitate extraction of the "pull-through," he picked up the rifle again and placed it muzzle downwards on his left foot. In cleaning with a rag the trigger became caught and the shot was fired. (One had heard a similar story from all kinds of men of different units, but one received the impression that this youth was too dull to have been coached in his story.) The earlier history is of reaching two standards from the top in an elementary school and then working in his father's florist's shop; he was only interested in solitary pursuits and he had broken off with a girl friend. Category C was recommended.

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THE RESULTS OF TREATMENT OF A THOUSAND CASES OF SCHIZOPHRENIA.

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THE cases reviewed in this paper were treated in Three Counties Hospital during the last seventeen years. The ages of the patients ranged between 15 and 44 years. Of the total 1,009 cases, 563 had insulin coma and convulsion therapies, while 446 received no such special treatment. Some had prefrontal leucotomy after failing to respond to insulin and convulsion treatments, but their number is small and they are not included here.

All cases had the same general management and nursing care. Those who were or became accessible had superficial or minor psychotherapy consisting of simple explanation and discussion of their problems and the nature and origin of their illness. In addition they had some form of occupation therapy.

In Table I is shown the total number of cases, their rate of discharge and their average stay in hospital, also the period with which their stay in hospital coincides. The response to the treatments of the clinical types of schizophrenia and an attempt at the prognosis are not dealt with here. They will be the subject of another communication.

DIAGNOSIS.

All the cases were well known to me and the diagnostic criteria are therefore essentially the same for every group included in this survey. Aubrey Lewis (1935) stated that, " Schizophrenia may be regarded for diagnosis and other clinical purposes as a form of maladaptation in which there are certain characteristic defects of inner harmony and consistency in behaviour, thought and emotion." The term schizophrenia being applied not to a definite disease, but to a clinical syndrome, the cause, pathology and course of which are uncertain, the views held as to its causation have largely determined the criteria of the diagnosis.

According to one theory schizophrenia is essentially of organic origin, the presence of which in a patient is signified by certain " process " symptoms occurring in those prone to the disease through constitutional factors. Psychoses of this type are the true schizophrenias. Schizophrenic symptoms may also occur in cases which are not thought to be liable by virtue of constitution to true schizophrenia. These latter cases are the atypical schizophrenias or " schizophreniform " psychoses. Langfeldt (1937) states that true schizophrenics show bad prognosis, while mixed and atypical cases in whom there is a strong admixture of manic-depressive and symptomatic trends exhibit a more favourable course.

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Another view of its causation on which diagnosis can be based is that of "reaction formation" of Adolf Meyer, who does not consider schizophrenia as of purely organic origin (Henderson and Gillespie, 1944). While recognizing that the individual may be loaded in various ways by inheritance, by physical defects of an endocrine disorder or some grosser kind, none of these is in itself a sufficient cause for schizophrenia. It is only when the subject has to battle with life's problems that reactions appear which cumulatively lead to a schizophrenic condition, and he concludes that schizophrenia is the end-result of faulty habits of reaction.

The diagnosis of the cases in our series was made after observation for a reasonable time and after taking into consideration the heredity, life history and prepsychotic personality, the history of the illness and previous attacks. In this survey are included only those cases in which the diagnosis of schizophrenia could be made with confidence on clinical grounds. Doubtful cases, those who matured into atypical manic-depressives, the feeble-minded and psychoneurotics with episodic schizophrenia which cleared up very rapidly, were excluded.

The duration of the psychosis was very difficult to assess accurately, and it was impossible to determine when the onset was insidious. Therefore, the time stated in Table II is approximate and implies the period from the first noticeable change in the personality of the patient up to his admission to hospital. As is generally recognized, and our remission rate confirms it, the prognosis is most favourable during the first year of overt illness, whether expectant or physical treatment is employed. It becomes gradually less promising.

Classification of Results.

For recording the results classifications were suggested by Muller (1936), James, Freudenberg and Cannon (1937), Hunt, Fieldman and Fiero (1938), Guttmann, Mayer-Gross and Slater (1939). I agree with Blair (1940) that over-classification with divisions and sub-divisions is confusing, and have classified the results into (1) Much improved (synonymous to recovery): Those sufficiently recovered to carry on at their old employment or other work equivalent to it. This implies disappearance of all active psychotic symptoms and the return to a substantially normal life in the community. (2) Improved: Those who improved sufficiently to be discharged from hospital to sheltered surroundings and able to carry on with less responsible work than previously, having not regained insight into their condition and retaining some residual symptoms. (3) Unimproved: Those who have to remain permanently in a mental hospital and the few who are removed by their relatives to be looked after as invalids at home, unemployable and vegetating.

For brevity, only the much improved and improved are given in Table I.

Cases which Received No Special Treatment.

This group of 446 cases received no special treatment beyond ordinary nursing care, routine hospital life, attention to physical health, some occupation

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therapy and the psychotherapy of friendly interest. Their improvement may be considered as being the nearest to spontaneous remission.

The majority of them were admitted to hospital before 1937, when insulin and convulsion therapies were commenced. After that date and up to 1942 there were still a number whose relatives objected to their being treated by these methods. Since 1942 all cases admitted have received some form of special or physical treatment. Of the 446 patients in this group, 156 (34·5 per cent.) were discharged. Their average stay in hospital was 8·3 months.

Cases Treated with Convulsion Therapy.

Treatment with convulsions as first suggested by Meduna (1935) was carried out by injection of camphor derivatives, cardiazol (metrazol) intravenously and triazol (azoman) intramuscularly. This method was superseded by that of Cerletti and Bini (1938), who induced fits by the passage of electric current through the head. A fit was induced every other morning and an average of 17 were given. At the beginning we had a few complications, such as dislocation of the jaw, and in one instance of the shoulder, and a few crush injuries to the bodies of the middle thoracic vertebrae, from which no deformity or disability followed. No fatality occurred. Later, as the technique improved, we had no complications.

Convulsion therapy was introduced into this hospital in 1937, and 82 schizophrenics were treated, 32 (39 per cent.) of whom were discharged. As a treatment for schizophrenia, however, it was realized that convulsion treatment alone did not give the results which its originators claimed. The improvement obtained was frequently not very stable. Fits (an average of five) were combined with insulin coma therapy and were found to be useful in sensitizing the insulin-resistant and to stimulate those whose improvement with insulin remained stationary over several comas. One hundred and three cases were treated with this combined method, and 56 (54·3 per cent.) were discharged.

Cases Treated with Insulin Coma Therapy.

Sakel's (1935) technique, which was used here, consists in injecting daily increasing doses of insulin until a coma dose is reached for each patient. Hypoglycaemic comas were induced five days a week, the duration of the coma being gradually increased from 20 minutes to an hour, when the patient was given glucose through a stomach tube or intravenously in order to regain consciousness. On awakening the patients were more accessible and some psychotherapy was used in the form of suggestion and reassurance. A course of treatment consists of 30 to 50 comas.

This treatment was started in this hospital in 1937, and was continued during the war in "The Homestead," a convenient villa in which 18 patients of each sex could be treated simultaneously. It was fortunate that the same trained staff was available throughout that time.

Of the 378 cases treated, 206 (54·2 per cent.) were discharged. The average number of comas was 34. It is known, and my experience confirms this, that

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comas are essential in bringing about improvement. Modified insulin therapy, for which only sub-coma doses are used, is not satisfactory as a treatment of schizophrenia. No fatality occurred in our series. At the beginning we had some complications; one patient had severe laryngeal spasm and another oedema of the lungs. Fits in hypoglycaemia were fairly frequent, but the commonest complication was delayed return to consciousness. With experience and improved technique, however, the occurrence of complications was reduced considerably.

Follow-Up.

Discharged patients were instructed to attend at intervals our Psychiatric Clinics for interviews. A simple questionnaire is also sent to the nearest relatives, requesting them to give their views on the patient's mental condition since discharge (and if possible to supply a comparison of his present condition with that previous to his illness), to give information about relapses and also the periods of employment and unemployment and the form of work he is doing. Our social workers supplement the information by their visits.

The follow-up of the group of 156 patients discharged after receiving no special treatment revealed that—

10 were out of hospital and well for 12 years and over.
12 ,, ,, ,, 10 ,, ,,
16 ,, ,, ,, 8 ,, ,,
25 ,, ,, ,, 5 ,, ,,
9 died.
62 relapsed.
22 were not traced.

Thus, 63 patients, 40 per cent. of the 156 discharged, or 14·1 per cent. of the total 446 reviewed, are known to have kept well for five years and over, while 62, 39·7 per cent. are known to have relapsed.

In order to compare the above findings with those of the group which received special treatments, only the results of the follow-up of patients discharged five years and longer will be given. From 1937 to 1942, 312 cases were treated with insulin and convulsion therapies, 188 were discharged as greatly improved and improved. Their follow-up shows that—

25 were out of hospital and well for 10 years
39 ,, ,, ,, 8 ,, and over.
53 ,, ,, ,, 5 ,, ,,
4 died.
54 relapsed.
13 were not traced.

Therefore, 117 cases, or 62·2 per cent. of the 188 discharged patients, or 37·5 per cent. of the total of 312 cases of this group, are traced and are known to have been well for five years and longer, while 54, or 30 per cent., relapsed.

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Conclusions.

Comparison of the results obtained show that there is no specific treatment f schizophrenia. It may be stated, however, that apart from more rapid nd more frequent improvement, the quality of the improvement was a striking eature of cases treated by insulin therapy. The patients who responded to t soon became brighter, with genuine spontaneity of conversation, interested n themselves, their illness and their surroundings, and gradually began to plan for their future. Their improvement is also more durable. The follow-up reports of many of these patients contain such phrases as, " Doing well, working regularly since discharge, excellent health, no relapse, leading normal social life," etc.

The average stay in hospital of the non-treated cases was 8·3 months, as against 5 months of the treated. The shortening of the sojourn, apart from the economic gain, has a favourable effect upon the whole attitude of the patient towards himself and his illness. It is noticeable that the presence of improving patients in a ward soon creates an atmosphere of optimism which is he basis of successful psychological approach.

Insulin and convulsion treatments are considered to be empirical, as no satisfactory rationale has so far been found. Insulin therapy produces in most patients a great improvement of the physical condition, and factors such as treatment within a friendly group (separated from the bulk of other patients) and receiving daily active treatment and attention, undoubtedly contribute towards their mental improvement. Patients soon realize that a serious attempt is made to assist them in getting well and that they are not left to struggle out of their illness by more conservative measures.

Summary.

The results of the treatment in a county mental hospital of 1,009 cases of schizophrenia extending over 17 years, is recorded.

The recovery rate for all the patients is shown as related to the duration of their illness.

For the purpose of evaluating methods of treatment two groups were considered—one consisting of 446 cases who received no special treatment and

Table I.—*Total Number of Cases Treated and Discharged, and Average Stay in Hospital.*

Treatment.	Number of cases treated.	Greatly improved and discharged.	Improved and discharged.	Total.	Percentage.	Average stay in hospital from admission in months.	Period.
No special treatment	446	58	98	156	34·5	8·3	1930–1942
Convulsion therapy (cardiazol and E.C.T.)	82	11	21	32	39	4·8	1937–1944
Insulin coma therapy	378	96	110	206	54·2	5	1937–1947
Insulin coma therapy with few convulsions	103	24	32	56	54·3	5·2	1937–1947
	1,009						

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TABLE II.—*Results According to Duration of the Psychosis.*

	Number of cases.	Discharged greatly improved and improved. Number.	Percentage
Symptoms 0–1 year.			
No special treatment	208	103	49·5
Convulsion therapy	38	20	52·6
Insulin coma therapy	176	130	73·8
Combined insulin coma with convulsions	42	32	76
Symptoms 1–3 years.			
No special treatment	137	43	32·1
Convulsion therapy	26	10	38·5
Insulin coma therapy	122	64	52·4
Combined insulin and convulsion	39	21	53·8
Symptoms 3 and more years.			
No special treatment	101	10	9·9
Convulsion therapy	18	2	11
Insulin coma	80	12	15
Insulin coma and convulsion	22	3	13·6

the other included 563 cases treated with insulin and/or convulsion therapies. The follow-up of the cases that were discharged for five years and longer showed that 14·1 per cent. of the first group were out of hospital and known to be well, as compared with 37·5 per cent. of those of the other group.

Mention is made of a few factors which contribute to the improvement of the patients treated with insulin therapy.

I am indebted to Dr. Neil McDiarmid, Medical Superintendent of Three Counties Hospital, for his encouragement and permission to publish this paper, and to Dr. F. Mackenzie Shattock for her assistance in its preparation, also to Miss Madeline Williams and Miss Evelyn Selley, the Social Workers, for their great help in the follow-up of the cases. My warmest thanks are due to the staff of "The Homestead," Three Counties Hospital, for their skilful nursing and continued enthusiasm.

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OBSERVATIONS IN ELECTRICALLY-PRODUCED EPILEPTIC CONVULSIONS.

PART I.

Tonic Neck and Labyrinthine Reflexes upon the Eyes.

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The pattern of the epileptiform fit produced by electric shock treatment is fairly uniform and constant. The four stages of the fit—the preconvulsive, tonic, clonic and post-convulsive phases—are characteristically expressed in postures and movements of eyes and head in each phase.

In the preconvulsive stage, which is usually of very short duration, the posture of the head does not undergo any change ; there is no contraction of the neck muscles nor of any other muscles of the body, as can be ascertained in delayed fits when this stage is prolonged. In this stage the eyes are most frequently found in a downward position. In the tonic phase, in an uncomplicated fit, the neck muscles contract and carry the head into strong retroflexion ; usually, as soon as this occurs, sometimes after a short interval, the eyes turn straight upwards. This movement is more abrupt and rapid when the interval between the preconvulsive and tonic phases is short ; it is a relatively slow movement when the interval is prolonged. Commonly the eyes remain in straight upward deviation throughout this phase. During the clonic phase this position, together with the retroflexion of the head, is maintained in the majority of cases ; it is not unusual that the eyes are found in a lateral upward position towards the end of the clonic stage. In the post-convulsive stage a lateral upward or a purely lateral deviation is present. The eyes are seen to leave this position after an interval of half to one minute, either to move toward the midline or toward the contralateral side, and slow gliding movements from one side to another may subsequently follow. Later, when the patients become restless, the eye movements tend to become irregular and jerky, nystagmus-like movements being frequently seen.

The head and eye movements in the delayed fits will be described specially ; they are characterized by prolongation of the preconvulsive stage from a few seconds up to about a minute. The general tonic spasm starts with lateral deviation of the head, and usually after some delay the eyes follow the head with a slow, giding movement in the same direction until they reach the extreme lateral position. Both head and eyes remain in this position throughout the tonic phase, while in the clonic and following post-convulsive phases they usually take up the same positions as in the uncomplicated fits.

The eye reflexes which we observed will be described for each phase separately :

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During the preconvulsive stage, if one turns the head to one side the eyes make a compensatory movement to the opposite side, and remain in this position as long as the position of the head is maintained.

In the tonic phase, in which the head is firmly fixed by the tonic spasm, the simplest passive movement to accomplish is the turning of the entire body. If the body be turned to one side, the eyes invariably follow the body, i.e. the eyes move in that direction in which the shoulder is lifted; if the left shoulder be lifted to an angle of 90 degrees the eyes will go into the extreme right lateral position, and will remain there as long as this position of the shoulder is maintained. If the body is then allowed to return to the supine position the eyes will again take up their previous position—that is, an upward deviation in the midline. The same effect can be obtained when the head is passively turned to one side; if the head be turned to the right, the chin towards the right shoulder, the eyes will go into the right lateral position. The degree of the reflex movements of the eyes is about the same in both these experiments. The response is distinct and of the same character when the head is rotated, or when one side of the body is lifted to right angles while the head is fixed in the midline; under both these circumstances the eyes move in the direction of the passive turning, but the reaction is not maximal, as in the first two conditions. The head is retroflexed, the eyes in upward deviation, during the tonic phase; if one turns the head passively downward, the eyes move down and keep this position as long as the head is ventroflexed; as a rule the eyes do not go beyond the midline. Because of the convulsive spasm, and of the short duration of the fit, passive movements of the body at various angles in the vertical plane could not be carried out. We confined our observations of eye position in this plane to patients placed in the prone position. Under these circumstances, in the majority of patients the eyes move from their previous upward deviation into the midline or below it and remain there as long as the prone position is maintained. In some cases this reaction may not occur; apparently the retroflexion of the head which keeps the eyes in upward deviation counteracts the opposite effect upon the eye position brought about by the prone position of the body, a counter-effect which can be more or less powerful. The reactions are similar when, as in the delayed fits, head and eyes are deviated to one side at the very start of the convulsion; the eyes will move appropriately into the midline or to the opposite lateral position, according to the passive movements of the head. It is possible to maintain the eyes in the midline if the head is prevented from moving into tonic lateral deviation.

In the clonic phase, where the eye and head posture is little different from that of the tonic phase, passive alterations of head and body position have the same influence upon the eyes. The reaction is often much less marked during the last few clonic spasms, and it is as a rule identical with the reaction obtained in the beginning of the post-convulsive stages.

In the post-convulsive stage the eyes deviate laterally and upward with the head still retroflexed and with definite moderate contraction in the extensor muscle group of the head; passive lateral movements of the head can be carried out without resistance. Less frequently, from the start of the post-convulsive phase the deviation of the eyes is lateralward without retroflexion

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of the head. In this period often only slight ipsilateral movements are observed when the head is passively turned or rotated; the reflex movement of the eyes is more extensive when the whole body is turned to one side. After a short time the eyes can be moved by neck and body posture reflexes, and fixed at any point of the orbit as freely as in the tonic or the greater part of the clonic phase. In the late post-convulsive stage, when inco-ordinated, jerky, pseudo-spontaneous movements of the body set in, the reflexes are still obtainable, though more difficult to observe and not so regular. By electrical stimulation of the sternomastoid muscles, the consequent rotation of the head to one side causes the eyes to move to the same side; if the head is prevented from moving whilst the muscle is contracting, the eyes remain fixed in their position. They return to their previous position when the head is passively turned to the mid-line, in spite of electrically-stimulated contraction of the muscle. In the post-convulsive phase, the upper eyelid participates in the downward movement of the eyes, which is elicited by ventroflexion of the head; both of these movements are tonic, and can be reversed by retroflexion of the head. The lid phenomenon is probably a synergistic movement; it does not appear in the tonic nor in the clonic phase, where the orbicularis oculi is in spasm.

No compensatory contralateral movements of the eyes were observed during the tonic or clonic phases, neither by slow nor by rapid passive movements of the head; such contralateral movements were occasionally seen in the later stages of the post-convulsive phase, when it was found that the eyes first made a contralateral movement but followed immediately the direction to which the head was turned.

In a number of cases syringing of the ears with cold water (10 c.c.) was carried out in the various phases of the seizure. The result was the same as reported by Hemphill (1940), who carried out the syringing during the various stages of the fit. When the reflexes here described were present, the labyrinthine stimulation with cold water elicited an ipsilateral deviation of the eyes with abolition of the quick nystagmus component. When observed throughout the post-convulsive phase the eye deviation elicited by syringing can be altered and ipsilaterally directed by passive alterations of head posture. When jerky movements have set in, the deviation of the eyes produced by cold water stimulation becomes less or disappears. Instead, both slow and quick nystagmus components appear, whilst simultaneously alterations of the head posture cease to influence the eye position.

Discussion.

We have observed:

(1) A tonic response of the eyes by alteration of the postures of the head relative to the body—obviously a tonic neck reflex; according to Magnus, the afferent impulses enter the first three posterior cervical roots, and the reflex centre lies in the uppermost cervical segments; the path conducting the impulses from there to the eye muscles is not known.

(2) Tonic reflexes with vertical deviation of the eyes, by alteration of body posture, with the head fixed, in the vertical plane, which represent tonic

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labyrinthine reflexes ; they were thought to be caused by the otoliths exerting a pressure or traction upon the maculae, according to the position of the head in space (Magnus, 1924). This opinion has not been corroborated by more recent experimental work, and the exact site of origin of these reflexes within the labyrinth is uncertain (de Kleyn and Verstegh, 1933; Hasegawa, (1931; Tait and McNally, 1934–5).

(3) A horizontal tonic eye deviation by alteration of the posture of the body in the horizontal plane ; neither in experimental nor in human pathology has this alteration in body posture been seen to elicit any kind of postural reflexes ; but we may assume that these reflexes are also mediated through the labyrinth.

Tonic neck and labyrinthine reflexes upon the eyes are well marked in animals with lateral position of the eyes, and have been analysed in detail by Magnus (1924) in his work on positional reflexes. They are compensatory in character, i.e. opposite to the direction to which head or body is moved. In higher animals and humans, with frontal position of the eyes, these compensatory eye deviations are rudimentary. It is assumed that rotation of the head evokes a stimulation of the semicircular canal and causes deviation of the eyes, and that under the influence of neck or labyrinthine reflexes this deviation becomes fixed. This opinion, however, is not generally accepted. Bielschowsky is of the opinion that only the compensatory movements obtained by rapid rotation of the head are of labyrinthine origin, and that the same eye movements caused by slow rotation of the head are optic reflexes. Ipsilateral tonic eye deviations do not occur under normal conditions of the nervous system. There are a few observations under pathological and experimental conditions. Holmes (1938) found compensatory movements in lesions which caused deviation of the eyes by passive turning of the head ; sometimes they were also present when the eyes were closed. Holmes (1938) stresses, as did Bielschowsky, the importance of the optic factor in the compensatory eye movements, especially that of fixation, but he does not exclude a labyrinthine component. He does not mention whether the compensatory eye movements in his cases were of tonic character. Apart from electric shock treatment, we have observed lately four cases of deviation of the eyes, with special attention to the neck reflexes. In the first case there was a permanent deviation of the eyes for several days, accompanied by a slight deviation of the head ; the active movement of the eyes to the opposite direction was absent ; the symptomatology pointed to a subcortical lesion damaging the frontopontine oculomotor fibres. In the second case there was a similar permanent deviation of the eyes ; the active movements to the opposite direction were reduced to guiding movements ; small scattered cortical haemorrhages were found, the most extensive being in the lower third of the posterior central and the bordering supramarginal gyrus. The other two were cases of Jacksonian seizures ; the seizures appeared at short intervals, and we had the opportunity of observing a great number of them ; one case presented deviation of the head and eyes, the other deviation of eyes alone. In none of these cases were we able to change the position of the eyes by passive movements of the head during the seizure. In experimental work on monkeys under mild anaesthesia Graham Brown (1922)

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found compensatory movements of the eyes by passive change of the position of the head, and he was able to influence this deviation by simultaneous electrical stimulation of the cortical oculomotor area. He does not mention whether the character of the eye deviation was tonic, and Magnus (1924) assumes in the discussion of these experiments that the deviation was merely the reaction to rotation. There are few reports of tonic neck reflexes eliciting ipsilateral deviation of the eyes. In immature and newborn children in the first two days after birth, Barany found that when the head was fixed and the body turned through an angle of not less than 90 degrees, the eyes deviated to the side to which the turning took place ; they remained deviated as long as this posture of the body was maintained. Magnus (1924) reports a case of a tumour in a child (details of the case are not given) in which ipsilateral eye deviation upon tonic neck reflexes was obtained. In the same monograph Magnus reports experiments on two monkeys who showed tonic neck reflexes with ipsilateral movements of eyes after removal of the cortex with preservation of the thalamus. Tonic labyrinthine reflexes with horizontal eye movements, i.e. horizontal deviation of the eye by movement of the body in space, have not been observed.

In the attempt to correlate the literature with our observations, we will first consider the relation of the direction of eye deviation to alterations of head and body posture. The contrast in the direction of the eye deviation is especially striking where a compensatory deviation in the pre-convulsive phase reverses quite abruptly into an ipsilateral deviation in the tonic phase, following the same alterations in head posture. It is unlikely that such opposite reactions should take place in consequence of the same mechanism. This sudden reversal must be related to a change in the mechanism involved. There is a difference in the character of the gaze ; during the preconvulsive phase, in which the compensatory eye movements were observed, the gaze was fixed and rigid, while in the following tonic and clonic phases, in which the ipsilateral eye deviation appeared, the gaze seemed to be empty and undirected. This fixed position during the preconvulsive phase does not arise as a consequence of body or head posture, in contrast to the eye position in the following stage. This suggests a mechanism for the compensatory eye movements arising primarily in oculomotor centres rather than in the labyrinth ; a rigid fixation of cortical or subcortical origin may play a decisive part, as Holmes assumes. Such a centrally-directed fixation does not necessarily mean a fixation on a definite object ; the fact that these compensatory eye movements may persist with the eyes closed is not inconsistent with a central origin.

The ipsilateral deviation of the eyes, observed almost throughout the epileptic seizure, is certainly due to tonic neck reflexes. These reflexes have not been found under normal conditions, nor have they been obtained in local cortical discharge, which leads to deviation of eyes and head. We have elicited them only as long as voluntary active movements of the eyes were absent, and the observations by Barany (1918) of tonic neck reflexes in the first days after birth emphasize the significance of this point, as it is known that fixation and voluntary movements of the eyes are not present at this period. These facts indicate that the release from higher oculomotor centres is one of

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the fundamental conditions for the appearance of these reflexes. They are of the same order as the tonic neck and labyrinthine reflexes upon the limbs, which are known to be especially marked in release at brain-stem level, as in decerebrate rigidity.

The release of the oculomotor brain-stem centres has its peculiar features according to the findings in the release syndrome in other muscle groups of the body, an increase in eye muscular tone would be expected. Holmes (1938) has emphasized the rigidity of the eye muscles in defects of eye movements caused by pseudo-bulbar paralysis, under conditions where the oculo-motor brain-stem centres are more or less isolated. We found no indications of an increased eye muscle tone during the convulsions, apart from a short period in the post-convulsive phase. On the contrary, the reflex as well as the spontaneous reactions of the eye muscles suggest a diminution of tone; during the convulsions the slightest positional alteration of head or body will direct the eye position, and in the post-convulsive phase the eyes are seen to float from one side to the other without being able to maintain a stable position. The only sources of tone for the eye muscles and for the regulation of their movements under the condition of epileptic coma seem to arise from neck and labyrinthine reflexes.

In a number of observations there is a short period at the beginning of the post-convulsive phase in which a lateral eye deviation occurs independent of head and body posture, and in which the tonic reflexes upon the eyes are less effective; as this is followed by the re-appearance of very marked tonic reflexes, a central causation of this transitory condition is unlikely. There is no special alteration in the condition of the body muscles coinciding with this change in the reactions of the eye muscles; possibly there is a connection with the clonic contractions which precede this phase, the convulsive movements may cause an excitation in the labyrinthine system, and a difference in the intensity of the excitation between each side could account for the deviation.

During the convulsions and in the post-convulsive phase, when the tonic neck and labyrinthine reflexes are obtainable, syringing of the ears with cold water is followed by ipsilateral deviation of the eyes. A similar reaction has been found by Rosenfeld (1910/11) and others in patients under moderate anaesthesia, with corneal and pupillary reaction present. Tonic neck and labyrinthine reflexes are not mentioned in these investigations. Rosenfeld found also that when the comatose condition becomes deeper the vestibular reactions upon the eyes disappear. We have not examined cases in moderate anaesthesia, but we examined a number of patients in fairly deep coma under various pathological conditions, and found, in agreement with Rosenfeld, that there was either no response following syringing with cold water, or very slight response when the stimulus was increased; tonic neck and labyrinthine reflexes were absent, as were all compensatory eye movements. In most of these cases the corneal reflexes were present, the pupils were contracted, and showed a very slight light reaction or none at all. Preliminary investigations on patients undergoing insulin treatment show that during the insulin coma, when the corneal and light reflexes are still present, the same combination as in the electrically-produced epileptic seizure is found; ipsilateral tonic neck

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and labyrinthine reflexes upon the eyes can be elicited and syringing with cold water make the eyes deviate to the ipsilateral side. The site of origin of the quick nystagmus component has been the object of numerous experimental investigations. It has been demonstrated in animal experiments that the quick component could still be elicited by vestibular stimulation when the brain had been removed down to midbrain level. According to Spiegel and Sommer (1944), the vestibular nuclei are the site of origin of both nystagmus components, the excitation being conducted to the eye muscles by way of the posterior longitudinal bundle and reticulate substance. On this basis the abolition of the quick nystagmus component in comatose patients is difficult to explain. Magnus considers that functional damage to the eye muscles may be accountable, but this is not satisfactory, as it is not borne out by clinical experience of such lesions. In our observations, deviation of the eyes and abolition of the quick component can occur in the presence of active light and corneal reflexes; when related to the above experimental results, this would mean that a selective functional damage had been done to formations at a low brain-stem level, whilst those at a higher level remained intact. Experiments of one-sided decortication, however, show that the cortex, i.e. the corticofugal pathways, has a definite influence upon the quick nystagmus component (Bauer and Leidler, 1911; Dusser de Barenne and de Kleyn, 1923; and de Kleyn and Verstegh, 1927). Moreover, experimental results on animals cannot be applied without reservation to human conditions.

The literature is contradictory on this subject. The following facts are significant: In certain comatose conditions (electric shock, epileptic seizures, insulin coma) and in premature children, ipsilateral deviation of the eyes (with abolition of the quick nystagmus component) can be produced by cold water stimulation and by tonic neck and labyrinthine reflexes. In the post-convulsive phase of the electrically-produced seizure, the eyes deviate upon syringing as long as tonic neck reflexes upon the eyes can be obtained; these disappear with the reappearance of innervating impulses, when the quick nystagmus component again becomes manifest. This suggests a pathophysiology common to both mechanisms; loss of voluntary eye movements and central muscular tone—signs of an isolation of oculomotor brain-stem centres—which are the main factors for the appearance of tonic neck and labyrinthine reflexes, may also be essential for eye deviation upon external stimulation. The eye movements have thus come under the exclusive control of primitive reflex mechanisms whose response is retricted to adversive movements.

Recently there is the tendency to move the site of origin of the epileptic mechanism from the cortex toward the brain-stem (Delay, 1946, and other authors), but definite facts for an unequivocal answer are lacking. Experiences on cortical stimulation still form the main basis for the interpretation of the pathophysiology of eye position and movements during the epileptic fit. Following his observations on electrical stimulation of the cortex, Foerster (1936) is of the opinion that the tonic mass movements, including the adversive movements of head, eye and body in the epileptic fit, have their origin in the extra-pyramidal cortical area (6αβ area of Vogt). Penfield (1939, 1941), whose experiences differ somewhat from those of Foerster, concludes that head or

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head and eye turning has a lower representation and occurs in the epileptic seizure when the discharge extends into the subcortical (extrapyramidal) centres. No turning of the head takes place when the discharge spreads rapidly into the subcortical extrapyramidal centres of both hemispheres, because the effects of both sides are then balanced. He is of the opinion that the frequency of upward deviation in epileptic seizures may be related to the frequency of upward deviation of the eyes obtained by frontal stimulation (areas $8\alpha\beta\gamma$ of Vogt). Some of Penfield's conclusions approximate to those of Muskens, who refers the conjugated oculomotor movements to subcortical extra-pyramidal centres. But these authors apparently agree that deviation of eyes and head during the generalized fit are co-ordinated movements, and due to discharge.

Our investigations show that neither of these conclusions is true in electrically-produced convulsions. In localized seizures of Jacksonian type due to focal cortical lesions, with co-ordinated deviation of head and eyes or with isolated deviation of the eyes, no tonic neck or labyrinthine reflexes upon the eyes can be obtained. The mechanism is quite different in generalized fits due to electric shock, where the eye position and deviation throughout the epileptic spasm is determined by tonic reflexes from the neck muscles. Upward deviation of the eyes, common in the electrically-produced fits, as in spontaneous generalized epileptic seizures, is thus explained as a tonic neck reflex, elicited by the preceding retroflexion of the head. The presence of tonic neck reflexes from the very start of the convulsions suggests the rapid onset of a low subcortical release mechanism.

Summary.

Tonic neck and labyrinthine reflexes during electrically-produced seizures are described. They lead to ipsilateral deviation according to the posture of head and body. Ventroflexion of the head causes downward deviation of the eyes; retroflexion of the head causes upward deviation. The upward deviation of the eyes commonly seen during the tonic phase is conditioned by the preceding retroflexion of the head. The primitive pattern of ipsilateral eye deviation has also been obtained by stimulation of the labyrinth with cold water. The physiology of these reactions has been discussed. The fact that these reflexes are manifest at the onset of the seizure suggests a sudden release of oculomotor brain-stem centres by the epileptic fit.

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PERIODIC CATATONIA.

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Kraepelin (10) in 1908 first defined a group within his classification of schizophrenia which he described as periodic catatonia. The clinical features of this type may be briefly summarized. The onset, usually between 14 and 20 years, is frequently characterized by a period of erratic conduct followed by an interval of stupor, confusion or excitement, which thereafter undergoes periodic remissions and relapses. The periodicity is remarkable in the rapidity with which all changes occur. In the periods of remission the patient is free of catatonia and associated symptom-complex (sympatheticotonia), but is still dull, apathetic and withdrawn; he often recalls events from the reactive phase, but without insight. The patient is still schizophrenic, with emotional flattening and poverty of ideation, and remains so throughout. In the reactive phase the picture is one of catatonic stupor or excitement, with clinical evidence of sympathetic over-activity.

The most clearly defined cases are those in which there is a synchronicity in catatonia and sympathetic function; in these the change in state is more rapid, the catatonia more profound. Gjessing (7) calls these the synchronous-syntonic group. Other less typical cases are described as asynchronous-asyntonic. The sympathetic changes synchronous with the onset of catatonia are those of adrenal-orthosympathetic over-activity. Increases in the pulse from 70 to 100–120 occur in a few hours. The blood pressure may likewise increase by over 40 mm. Hg. There is pallor, cold clammy extremities, mydriasis, fleeting anisocoria, and, during stupor, a fine tremor and retention of urine. Even when the patient is immobile night and day there is an increase in B.M.R. Urinary output and weight decrease and the viscosity of the blood increases.

Gjessing (7) has studied this group of patients, recording many variables and body-constants over 3,500 "patient-days." He charted the following: psychic state, urinary output, specific gravity and constituents (ammonia, titratable acidity, chlorides, phosphates, indican, sulphate, and nitrogen output), oxygen intake, carbon dioxide excretion, respiratory quotient, alkali reserve, haemoglobin, white cell count, blood sugar, plasma nitrogen, body temperature, weight, and pulse rate. He also made estimations of the nitrogen balance.

As a result of this momentous amount of work, a relationship has been established between the nitrogen balance and the periodicity. This further resolves itself into two types which Gjessing calls types A and C. In type A the patient increases his nitrogen store to a peak, and shortly after excretion starts, catatonia develops, only to disappear when the store has been eliminated. In type C the catatonia starts at the end of the period of excretion and persists

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throughout the building up of the store of nitrogen. Gjessing was also able to demonstrate that the electrocardiogram shows a flat T1 during nitrogen retention irrespective of the mental state. The non-protein nitrogen in the blood follows the nitrogen periodicity. A rise in the blood sugar is seen in both types at the onset of the catatonia and orthosympathetic phenomena, but in type C the level remains above normal in the quiescent periods, in type A below normal.

It can be seen from a study of type C that the increased metabolism of the reactive phase is not the cause of the nitrogen swings, for here there is retention during activity. Stokes (16) has reported a case with characteristic metabolic studies in which later it was possible to demonstrate periodic catatonia, not with phasic changes, but with a steady accumulation of nitrogen.

It may be stated, therefore, that in periodic catatonia the mental state is not the direct cause of the known biochemical changes, nor are the latter the immediate cause of the former.

The two cases that are reported below have been studied over a long period. Only one body constant has been recorded, that of body weight. As this may reflect the total metabolism of the individual better than a record of the individual parts thereof, it may be deemed relevant to the study of periodic catatonia.

CASE 1.—The patient was born in 1919. His father died of melancholia in 1928. His earlier life can be briefly summarized as follows. He attended school till 15 years old, with two years' post-primary education. The subsequent year he spent as an office boy, and during the next year he had three jobs. During this period he became progressively more retiring, self-conscious and " absent minded," and often day-dreaming.

He was first admitted in July, 1936, after three weeks' excited schizophrenic behaviour. During the first two months he showed two periods of excitement with fairly rapid onset. He asserted that he was Edward VIII, and that he was to marry his sister, and make her Queen of England. This fluctuating course persisted for eight months, with his weight varying from 9 st. 7 lb. to 8 st. 6 lb. His weight then increased to 11 st. 5 lb. and at the same time his mental state improved, so that after five months in a parole villa he was released on probation and later discharged recovered.

For nearly two years after his release he worked in the country. In July, 1939, he was arrested for petty theft and readmitted. For four months he was periodically restless, noisy, erratic, and abusive, with at times signs of the catatonic stupor, later so pronounced. During this four months his weight rose from 9 st. 8 lb. to 11 st. 6 lb. At this stage he again improved, and after 8 months was discharged recovered. The record of his weight is of interest at this period. One month before his discharge his weight was 12 st. 4 lb., at the time of his discharge 11 st. 2 lb. Three days later he returned for admission as a voluntary boarder as a precautionary measure on account of some restlessness. His weight was 10 st. 13 lb. He relapsed and showed periodic catatonic behaviour a week later. He was formally committed three months later after he attempted to commit suicide, prompted by the bad thought he got from the Devil. For two years (1941 and 1942) he showed a continuation of the periodicity of catatonic phenomena, with quiescent intervals during which he was well enough mentally to work with a party. His weight through these two years varied from 9 st. 6 lb. to 10 st. 11 lb. The next three years showed a progressive worsening in the degree and length of the stupors. In the quiescent periods he was dull, apathetic and indifferent, but able to do routine tasks under supervision and care for person and clothes. In a stupor he lay curled up, immobile, mute, indifferent to personal habits and resisting all attention. The maximum recorded weights over these three years are 9 st. 12 lb., 9 st. 5 lb., 8 st. 11 lb., and correspond to the progressive increase in length and depth of stupor.

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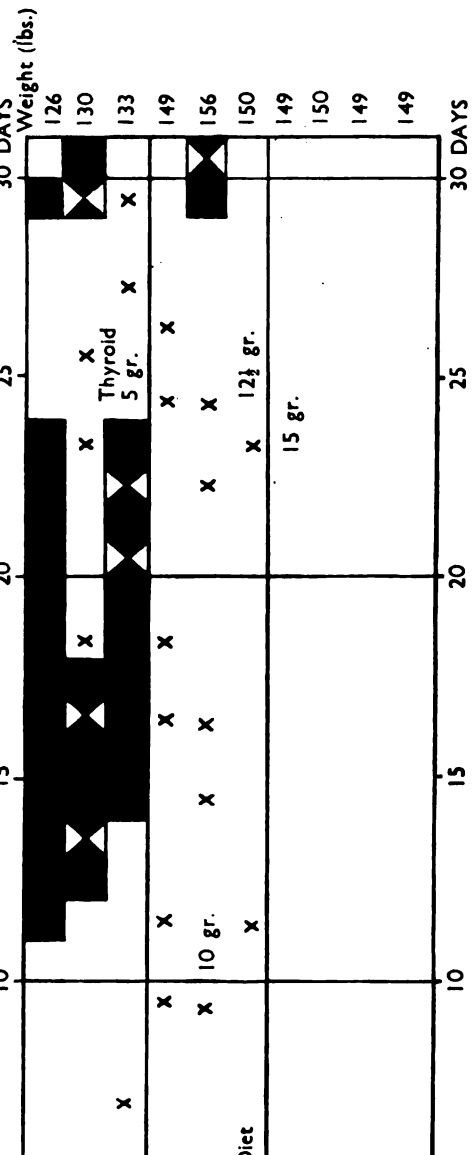

CASE 1.—Diagrammatic representation of the progress of treatment.

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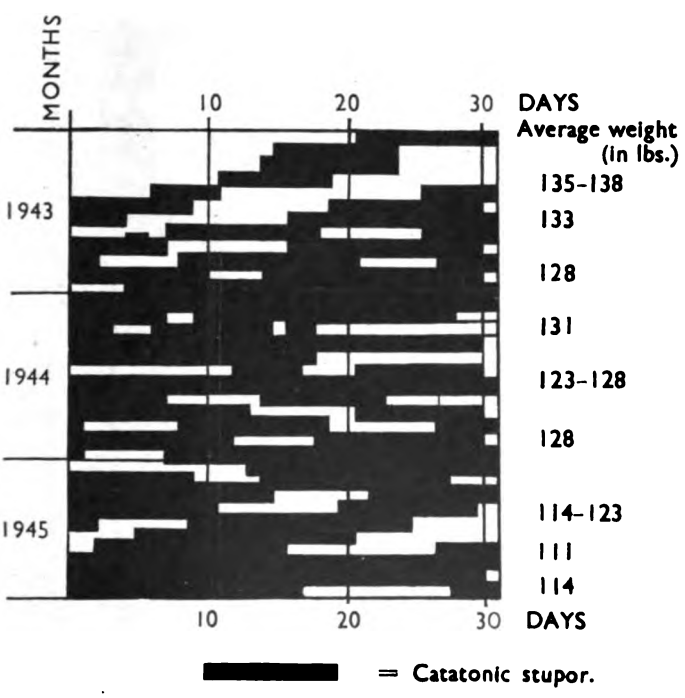
The minimum weight recorded was in June, 1945, 7 st. 13 lb., near the onset of the longest stupor recorded in his files—78 days. Towards the end of this stupor the toes showed marked " Raynaud's " phenomena, which progressed till they were nearly gangrenous. With the termination of the stupor these improved spontaneously. This observation was presumed to be an index of the intensity of the orthosympathetic over-activity. The pulse rate was frequently up to 130 in a stupor and between 70 and 82 in quiescent phase. Axillary temperatures were recorded up to 99·2° F. in a stupor.

After several more stupors in 1946 of up to 20 days' duration, with a body weight between 8 st. 4 lb. and 9 st. 2 lb., active treatment was instituted in July, 1946. E.C.T. was first given. Resulting from this was an increase in weight over two months of 7 lb. Stupors appeared to recur, but each recurrence remitted after



CASE 1.—Periodicity of the catatonic stupor for 34 months (represented diagrammatically).

two E.C.T. In the next two months he was given thyroid extract (5 gr. per diem, increased to 10 gr. after six weeks), with also approximately the same number of E.C.T. as in the previous two months. His weight increased by 23 lb. in the two months and he had only two short periods of stupor—five days in all. Body weight at the end of this two-month period was 11 st. 2 lb. He remained free of periodic catatonia.

Further treatment was continued. According to the recommendation of Gjessing, he received a low protein diet (qualitative). The thyroid extract was increased to 12½ gr., then 15 gr. per diem and the E.C.T. tapered off. In this quiescent phase the basal metabolic rate was — 7 per cent. on thyroid extract 15 gr. per day. With the increase in thyroid dosage his weight dropped to a steady level between 10 st. 5 lb. and 10 st. 9 lb. In the next six months he remained at a fair institutional level, he was still dull and apathetic, and still had nocturnal enureses. The thyroid dose remained at 15 gr./day and his weight 11 st. to 11 st. 8 lb.

CASE 2.—This patient was born in 1902. Until 1937 he had an excellent record. He was a university graduate, and a good athlete, though shy in his manner and bearing. There was no family history of instability. The onset of the psychosis was sudden and he was admitted in April, 1937. When he was first examined

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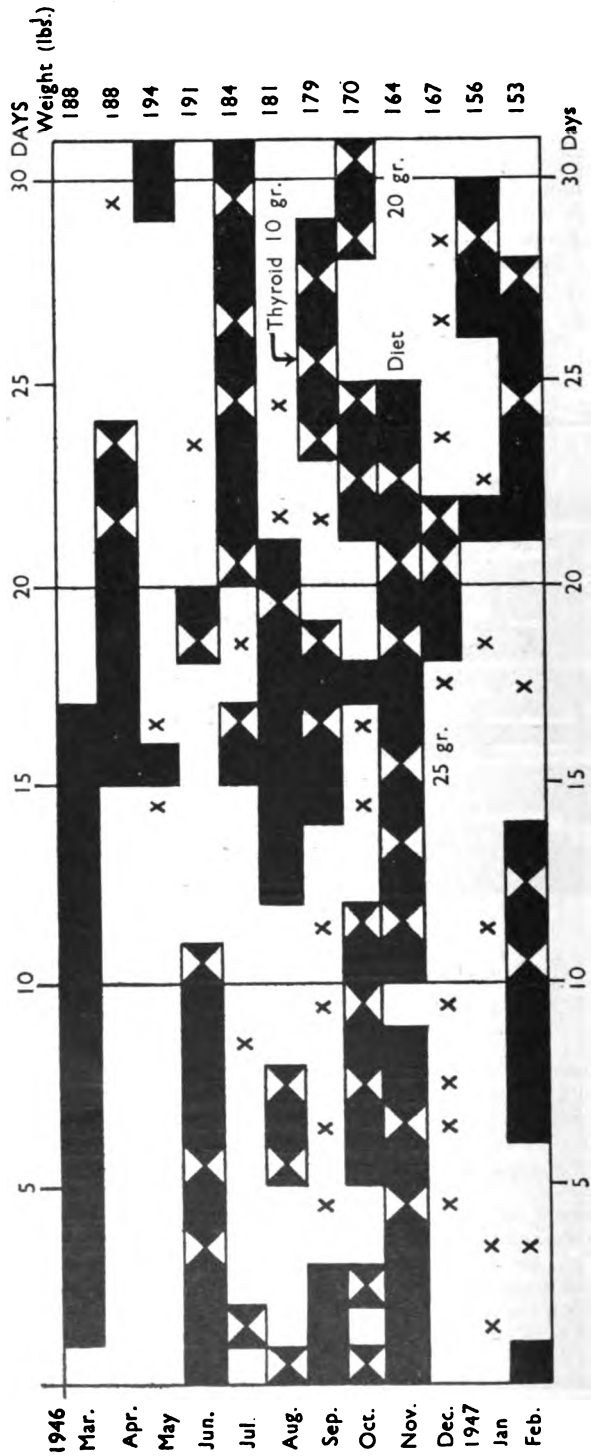

CASE 2.—Diagrammatic representation of the progress of treatment-symbols used are the same as in Case 1.

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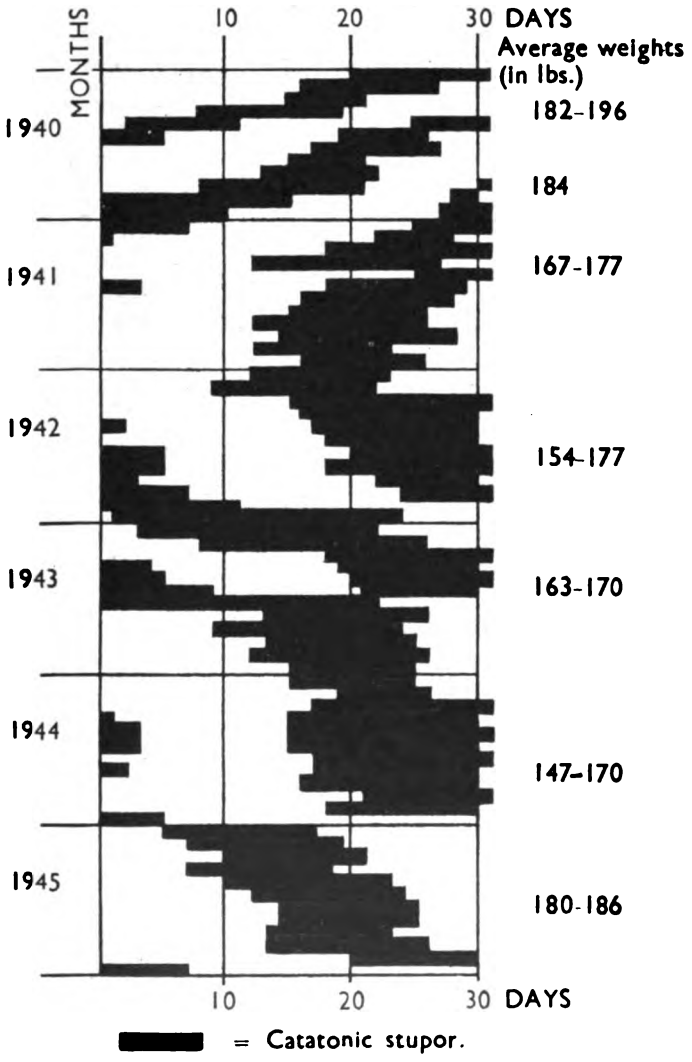
he was usually co-operative, though at times vague and hesitant. On other occasions his speech was rambling, with intervals of silence, loss of train of thoughts and tears for no apparent reason.

" It's dawning on me now, I'm St. John, John of Runnymede, King John. . . It's being revealed to me I'm Sir Percival, the knight who saw the Holy



CASE 2.—Periodicity of the catatonic stupor for 72 months diagrammatically represented.

Grail. . . . You're the fellow—, the engineer, I'm the protector of the poor and I've been betrayed. . . . No! I haven't been betrayed." He denied hallucination, but stated " It's all within me." This type of conversation and his schizophrenic behaviour has persisted in his quiescent phases ever since.

Shortly after admission he became restless, more confused, fragmentary in speech, and neglected his bodily habits. He rapidly changed into a marked catatonic stupor, lying curled up on his back, staring at the ceiling for hours with negativistic and impulsive behaviour if disturbed. This period of catatonia remitted, but was followed by another in three weeks. In this second stupor he had to be cathe-

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terized for retention. For the next eight years and six months the periodicity of the catatonia was regular, and in this period of 102 months he had 116 periods of stupor. The duration, sequences, and body weights over six years can be seen in the graph.

In January, 1946, he was subjected to a full investigation of his urinary tract following further episodes of retention. No lesion was found, nor would such be likely to be found if the retention were due to orthosympathetic over-action as postulated. In the next three months he had three periods of stupor of 12 to 14 days' duration, with a sequence similar to those immediately preceding it. In the catatonic phase the pulse varied from 96 to 118 and the axillary temperature reached as high as 99·4° F. In the quiescent phase the pulse was recorded between 70 and 80.

E.C.T. was started in April, 1946, and after an initial favourable response (the predicted stupor was represented by one day of erratic conduct) associated with a gain in weight of 6 lb. he relapsed. For the next four months the stupors recurred more frequently, but each could usually be interrupted by two or three E.C.T. The weight dropped 15 lb. Thyroid administration was then started (10 gr. per diem of thyroid extract), and this made the situation worse. The stupors remained as frequent, but no longer responded to E.C.T., so that he had six stupors in eight weeks with only 14 days in the quiescent phases. His weight dropped in this two-month period a further 15 lb.

Temporary success was gained by increasing the thyroid extract to 20 gr. and then 25 gr. per diem. He had one four-day stupor in 54 days. His weight did not fall, though he was for this period on a low protein diet (qualitative). Regular E.C.T. was continued once or twice a week.

A relapse followed, associated with another fall in weight of 13 lb. He changed little in the next six months. Weekly or fortnightly E.C.T. was continued to interrupt the stupors. Their frequency was thus still increased. The body weight remained at 12 st. 6 lb. approximately for most of this period. Thyroid was discontinued after the period recorded in the graph.

Comment.

These two cases represent examples of the least common type of periodic catatonia. Two-thirds of the cases are females and excitement is commoner than stupor.

The course of the illness in these two patients is different. Cases with a clockwork regularity over decades are recognized, and others with progressive intensity of the syndrome over years with or without remissions are also identified.

The first case conforms to all the criteria, including the therapeutic test with thyroid for periodic catatonia. Apart from the therapeutic failure in the second case it likewise appears to be indubitably a case of periodic catatonia. The fact that the underlying process is schizophrenic is well shown in the second case with manifest schizophrenic symptoms present in all the quiescent phases.

It has been possible to follow the body weights of these two patients over the period of illness and the variations have been recorded. The first case shows several facts of interest. The patient has never been free of catatonic behaviour of a periodic nature with a body weight of less than 11 stone (approximately) before treatment. With thyroid he achieved this at a level of 10½ st. The lower his weight has been, the longer have been the periods of catatonia, and *vice versa*. His most profound stupor was associated with the most marked sympathetic phenomena. In the second case some less marked correlation appears to exist between the body weight and the length of the stupor. The

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observation of interest in this case is in the therapeutic failure. The patient over four months with E.C.T. alone lost 15 lb., in the next two months with thyroid and E.C.T. another 15 lb. The catatonia was worse. The first patient gained 7 and 23 lb. on a similar sequence, and was free of catatonic behaviour.

Studying this body weight constant in the reported cases, there appears to be a relationship between body weight and the symptoms. Periodic catatonia does not remit unless there is a gain in weight. Gjessing's (7) case C. J. L— shows a more frequent and longer catatonia with a lower body weight. Stokes' (16) case shows similar changes: thus the ratio between duration of catatonia to quiescent phase was 2 to 1, with the weight between 8 to 9 stone, but between 9 st. to 9½ st. the ratio was 6 to 5. These figures are only approximations in view of the small scale of the reproduced graphs. Later phases in Stokes' case appeared to have an ill-defined end to the catatonic phases with the weight over 10 st., suggesting a further lessening of the degree of stupor. There is no doubt that gross anatomical lesions of the hypothalamic nuclei can result in alterations in weight and metabolism. The body weight has been used tentatively as an index of the ability of the hypothalamic centres to control a normal internal environment.

Discussion.

Much suggestive work has been done that throws light on the synchronous catatonic orthosympathetic phenomena. De Jong (5), after many experimental studies, considers that catatonia is a "general" reaction form of the C.N.S. which, like symptomatic epilepsy, may have many causes, and likewise represents a non-localized motor discharge syndrome of the C.N.S. The sympathetic phenomena accompanying catatonia he attributes to the overdischarge of the centres. Experimental lesions in the posterior hypothalamus have produced hypokinesis and akinesis, and Bailey (2) has demonstrated a cataleptic element with these lesions. On the other hand, cortical stimulation is facilitated by simultaneous hypothalamic stimulation. Affective (rage) reactions are demonstrated in stimulation of the intermediate zone, and orthosympathetic overactivity dominates from posterior hypothalamic lesions. Similar reactions are induced in decorticate animals from very ordinary stimulation. Cairns (4) has reported a case of third ventricular cyst with akinesis and mutism. Likewise Furtado (6) has noted a similarly placed cyst with catatonia. A case of pituitary cachexia with catatonia was recorded by Stocks (15). Cases of hypothalamic lesions with excitement have been reviewed by Alpers (1). A few reports are available dealing with paroxysmal autonomic discharges, either as a diencephalic autonomic epilepsy (Penfield (13)) or post-encephalitic autonomic crises (Oller (11), Ostow (12)). The case reported by Ostow (12) showed post-encephalitic crises with cataleptic manifestations, such as akinesia, rigidity, and mutism, with concomitant autonomic reactions consisting of diaphoresis, rapid pulse, fever and hypertension. Oller's (11) case showed hyperkinetic reactions and aggressiveness, associated with an autonomic discharge. Thus the clinical picture is like the periodic catatonia-orthosympa-

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theticotonia of periodic catatonics, apart from the time course of the disturbance. This difference can be correlated with the fundamental disease-process responsible for the discharge. In post-encephalitic states episodic manifestations are common, and are comparable in duration with the disturbances in the cases quoted. The relationship of periodic catatonia to schizophrenia is discussed later.

It is in catatonic schizophrenia particularly that physical signs are most evident. These signs are of sympathetic nervous function disorder and are not those of recognized endocrine disorders. On the other hand, paranoid states with a paucity of such signs show a relatively high incidence of endocrine tumours at autopsy (Pollak (14)). From these considerations it is suggested that the catatonic sympathetic phenomena of catatonic schizophrenia are a definite somatic syndrome associated with schizophrenia, and that this syndrome is a reaction pattern of the C.N.S., probably hypothalamic in origin. The possible significance of the fact that the sympathetic phenomena appear synchronously and in a pure culture of orthosympathetic overactivity in periodic catatonia will be examined later.

The other *sine qua non* of periodic catatonia is the basic schizophrenic illness. In the quiescent periods the schizophrenic nature is usually apparent. In the reactive phases they are obvious catatonic schizophrenics. Referring briefly to the two reported cases, it is suggested that the difference in the course between the two is related to the degree of the basic schizophrenia. The first case with remissions showed only mild symptoms during the quiet phase, but the second with a relentless periodic course was markedly schizophrenic. Further life history studies of these patients are required to confirm or refute this suggestion.

Following Stokes' (16) demonstration that the periodicity could continue without phasic nitrogen swings it becomes necessary to classify this latter with other secondary phenomena. The treatment for periodic catatonia advocated by Gjessing (7) is the administration of thyroid hormone. This was devised to eliminate the nitrogen storage. The pharmacological response following thyroid administration is an increase in metabolic rate. A decrease in body weight and elimination of nitrogen are probably secondary results of this increase. The marked increase in body weight that follows thyroid administration in periodic catatonia (favourable response only—Case 1) is difficult to fit into accepted ideas. It would seem more logical, however, to explain the therapeutic response in terms of the more fundamental action. In the two cases reported, the favourable response to treatment only occurred in the case with a weight increase during thyroid administration. It is suggested that a thyroid-hypothalamus interrelationship is involved and that, as the hypothalamic control of the internal environment improves, in a favourably responding case, the body weight is approximated to the mean for height and build.

Theories to date to explain the nature of the illness appear to be two in number. The intoxication hypothesis, particularly amine intoxication, has been repeatedly suggested as a cause of many types of mental illness, and Gjessing (7) suggested it as a possibility in periodic catatonia.

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The weight of evidence is against any such amine intoxication hypothesis, even though certain amines can cause mental symptoms, catatonia and sympathicomimetic changes, e.g. 3-4-5-trimethoxy or 3-4-dimethoxy derivatives of phenylethylamine. It has also been shown that some secondary carbinamines inhibit brain respiration in dilutions approaching *in vivo*. Jantz (9) has shown that metabolic changes can occur after 3-4-5-trimethoxy-phenylethylamine similar to those in schizophrenia. Stokes (16) has shown in his reported case periodicity of mental state, at first synchronous with the phasic nitrogen changes, and then later independent of these metabolic changes. The nitrogen changes are not, therefore, the immediate cause of the mental changes. The changes reported are those of total protein metabolism and not just amine excretion. Gjessing (7) noted the occurrence of supernumerary phases after the thyroid administration had produced considerable nitrogen loss.

A second possible hypothesis is posed as a question by Stokes (17): "Is there a rhythmic upset of endocrine function more fundamental that the overt periodicity?" The overt periodicity is one of central autonomic regulation and catatonia. It is unlikely that there is a more fundamental rhythm than the central autonomic cycles except from higher centres controlling the hypothalamus.

It is proposed to examine the periodicity of central autonomic regulation in more detail, but before so doing it is advisable to note briefly some observations on the maintenance of homeostasis in schizophrenia.

Hoskins (8) and co-workers have studied over years many body constants and variables in schizophrenia. They come to the following conclusions: The functional level of some body constants is set at a lower level than normal. Subject to external influences (e.g. metabolic stimulants) these levels show lesser responses than normals. Despite this, however, the range over which they function in maintaining homeostasis is greater than normal. The "physiological withdrawal" of schizophrenics (decreased response to external factors) is associated with a decreased stability of the control of the internal environment. In periodic catatonia there is an increased lability in the control of various body constants. It might be deduced that such defective control would tend to magnify the amplitude of the phases of nitrogen balance. Also, studies of the nitrogen balance in normals, for example with menstrual cycles, would show a lesser variation than periodic catatonia. Quantitative data on the premenstrual nitrogen retention do not appear to be available in this country.

To provide a hypothesis for an illness with a periodic course it is necessary to consider the mechanism both for the onset and for the remission.

The only features that clearly separate periodic catatonia from catatonic schizophrenia are the orthosympathetic phenomena and the periodicity. They are otherwise clinically indistinguishable. Therefore if some characteristic mechanism can be formulated to explain the remissions, it would be reasonable to attribute the onset of periodic catatonia to the factors concerned in the genesis of the catatonia in non-periodic cases. The invariable association of schizophrenia with both the periodic and non-periodic type suggests an explanation of the onset.

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In the studies of the onset of schizophrenia Boisen (3) and others distinguish three methods of reacting during the development of the psychosis—the drift into a psychotic state, the delusional misinterpretation, and the panic reaction. This third type is one in which " the individual is likely, in Malamud's phrase, to become aware that he is tasting forbidden fruit and to sense the danger in which he stands and to become fearful of it " (Hoskins (8)). The disturbances may take the form of either stuporousness or agitation. It is this type of reaction that occurs in patients later described as catatonic. To quote Hoskins further (8), " primarily his reaction seems to represent a manful if misguided attempt to solve his inner problems."

This type of panic onset can further be orientated into accepted neural mechanisms. The usual response to a " fear-panic " situation is one of orthosympathetic over-activity, with hyperkinetic, or akinetic and cataleptic patterns of motor activity. The peculiar nature of the pattern in a panic situation reflects the various past experiences, habits, and intelligence of the normal, whereas the kinetic quality of the response is the result of hypothalamic stimulation activity. Likewise, in catatonic schizophrenia, the detailed pattern of the catatonia reflects the disordered processes of the psychosis, whereas the quality of the kinetic element and the orthosympathetic over-activity are due to hypothalamic activity. As indicated above, the hypothalamic control in schizophrenia is more labile than in normals. Applying this concept to periodic catatonia, a most striking similarity is demonstrated in the intense orthosympathetic activity—an emergency or fear reaction in almost pure culture. As Gjessing (7) described, these phenomena are syntonic and synchronous with catatonia in periodic catatonia. The hypothalamic response is integrated towards one end. Thus it is assumed that if the hypothalamic response to a panic situation is integrated it produces some amelioration in the schizophrenia and a period of recovery from catatonia-orthosympatheticotonia. If the cause remains, i.e. the schizophrenia, relapses will occur. The liability to relapse will depend on the intensity and persistence of the schizophrenic process, and the stability of the level of homeostatic control. The more defective the homeostasis the more marked the periodic catatonia.

On the other hand, where the hypothalamic response is asyntonic—i.e. not integrated to one purpose—and asynchronous, periodicity, as such, is irregular, gradual in onset and remission, and may be absent over long periods.

The more common cases of catatonic schizophrenia with a very irregular time course show no co-ordination or integration of the hypothalamic response. Thus both orthosympathetic and parasympathetic over-activity may coexist and may bear no temporal or other relation with the kinetic variation. This failure of integration in a central nervous reaction leads to its persistence, in the asynchronous and asyntonic form. In the acute catatonic schizophrenic reactions, the favourable response is possibly due to remission of the basic acute schizophrenic reaction. In some cases it might be attributed to the integration of the panic reaction, which appears to be fairly definite, in many of these acute reactions.

Improvement in the schizophrenia is likewise absent with defective integration of this hypothalamic neural pattern. The periodic improvement of

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the psychosis in periodic catatonia is of considerable interest, but it is not proposed to deal further with hypothetical aspects of the interrelationship between psychosis and hypothalamus, especially as regards E.C.T., insulin therapy and leucotomy. From a consideration of the therapeutic and spontaneous remissions it might be deduced that a possible mechanism for the remission would involve the increased metabolism of thyroid administration and orthosympatheticotonia respectively. Whether this is so or not, it would appear likely that the *locus operandi* is the hypothalamus.

It is necessary to examine the contributions of previous authors in terms of this hypothesis. If it is now applied to Gjessing's (7) types A and C it is possible that the following is valid. In type A where the periodic phenomena are most marked it is likely that the nitrogen balance will follow the periodicity in a uniform direction, i.e. almost co-temporaneously with the increased metabolism, the nitrogen balance will fall. In type C, with less intense periodic phenomena, it is possible that the reversal of nitrogen balance phases is an expression of the asynchronicity and asyntonicity, which in the common type of catatonic schizophrenic is a predominant feature in the somatic syndrome.

If the degree of disturbance of the control of homeostasis is reduced, improvement will result, but still dependent on the intensity of the schizophrenic process. With a normally controlled internal environment the body constants will tend to return to their mean range of values. At some stage of improvement it is suggested that some factors (such as nitrogen balance for example), which in marked disturbance follows the periodicity closely, may become divorced from this periodicity and move in a uniform direction towards a more stable and safe level (this is to explain Stokes's (16) case with catatonia and no nitrogen swings, but with increased body weight, and nitrogen accumulation).

Conclusion.

Briefly stated, the hypothesis here advanced states that the kinetic and sympathetic phenomena of catatonic schizophrenia are of hypothalamic origin. These phenomena are a specific neural reaction pattern to the " panic " onset of the psychosis. If this pattern is integrated it serves to restore the normality of the hypothalamic centres with some improvement in psychosis *eodem tempore*. This is the case in periodic catatonia. In non-periodic catatonia the specific hypothalamic pattern is disintegrated. The efficacy of the reaction depends on its degree of integration, on the degree of causal schizophrenia, and on the level of hypothalamic control of the internal environment at that particular time.

Summary.

1. A review of the condition of periodic catatonia is made.

2. Two cases are reported.

3. An analytical study is conducted into the nature of the symptoms of the disease.

4. A hypothesis is put forward about the nature of catatonia.

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My thanks are due to Dr. J. Russell, Director of the Division of Mental Hygiene, Dr. B. D. Hart, Medical Superintendent of Porirua Mental Hospital, and Dr. R. W. Medlicott, Medical Superintendent of Ashburn Hall.

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MISINTERPRETATION OF MIRROR IMAGE OF SELF IN PRESENILE CEREBRAL ATROPHY.

By R. E. HEMPHILL, M.A., M.D., D.P.M.,
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DENIAL of knowledge of personal identity is occasionally encountered in various mental disorders. Temporarily present sometimes in hysteria, in schizophrenic psychoses it is expressed as a delusion that identity or name has been altered, and it may be a feature of the depersonalization syndrome. Seniles may maintain that they do not know or have forgotten who they are.

Although the question whether the ability to build up a body image and to identify self depends on impulses received from somatic and visceral structures is uncertain, normal individuals have a strong tendency to preserve the conception of self intact even after mutilation. The armless man does not regard himself as a different kind or new organism, but as the same being he formerly was, now deprived of the use, but not necessarily the existence, of an amputated member—a tendency well demonstrated by phantom limbs. The existence of individual members of the body is denied only in abnormal psychotic conditions and organic brain disorders.

The individual has an incomplete knowledge of his external appearance and patterns of shape and movement. He knows only what he has learnt from observing himself in a mirror or from photographs. This information is limited by physical factors, such as angle of vision, position of eyes, light, size of mirror, and flexibility of the body, so that it is practically impossible to recognize oneself from an unfamiliar angle—from the side or behind. The most important mirror image is the face—it is recognized easily, but the appearance of other parts of the body can seldom be recalled; thus, the hands, which one is accustomed to see directly from a certain viewpoint, look unreal in a mirror; while an unexpected encounter with oneself in a full-length mirror gives the impression of meeting a stranger.

The mirror image is an illusion in which the individual projects himself from without his body and accepts the reversal of right and left without difficulty. The marked difference between what an individual sees in the mirror and what others see of him is well demonstrated by self-portraits, which have a strange unreal quality, and are quite unlike portraits of others painted by the same artist.

To accept the mirror picture as a real image of oneself requires that certain conditions are automatically and unconsciously fulfilled: (1) The mirror must be accepted as a faithful instrument, and no doubt be entertained that

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the person whose movements and dress are seen reflected is not really a stranger behind a glass who mimics every action. (2) The recollection of previous mirror pictures must be sufficiently clear to enable identification to be made immediately, irrespective of change of dress. (3) The mirror must be recognized as a reflecting instrument, so that a reflection is immediately identified as such. Failure to perceive that there is a mirror is the basis of many conjuring illusions, and there is no reason why a mirror image should be regarded as a personal reflection unless the mirror situation is comprehended.

It is therefore surprising that the literature contains almost no references to failure to identify oneself in a mirror after organic brain change, and, unless severe agnosia interferes with the recognition of the mirror as such, the mirror image is almost invariably correctly identified.

In the case reported below, not only was the patient unable to recognize herself in a mirror, but she contended, in all but experimental conditions, that what she saw was in fact her sister.

Case history.—A. C—, aged 62, married. Admitted June 2, 1942.

Family history.—There was a strong family history of insanity. Her mother became insane and died in a mental hospital in middle life, cause unknown. One sister died in a mental hospital, cause unknown. Another sister's son died in a mental hospital, aged 18, probably a schizophrenic. Another sister's son developed schizophrenia and is now in a mental hospital. Her father died of pneumonia aged 64.

Patient's previous history.—Her childhood was normal. She was of average ability at school, and described as being always smiling and happy, capable and methodical. The home was comfortable and well kept. She was the youngest of a family of 2 sons and 5 daughters. Polly, the second eldest, was 18 years her senior. Polly did not marry, and kept house after the mother's death, bringing up the patient from the age of 4. At 24 the patient married. There were no children, the circumstances being poor. Her husband was a railway warehouseman and she worked out as a daily domestic. Polly lived with her and her husband. These arrangements continued for 25 years. After the menopause at 50 the patient stayed at home. A slight intellectual defect became evident about this time, and she began to make mistakes in bills, and on this account gave up her work. By six years later, at 56, her memory was noticeably bad, but she was still able to do housework and some shopping. Four years later Polly died. Immediately the patient (then 60) became very much upset, so that she could not be permitted to go to the funeral. Thereafter she refused to admit that her sister was really dead, and referred to her as a living person. She evidently missed her very much. A few days after the funeral she disappeared, and was discovered a week later 80 miles away, at Exeter, where she had spent her childhood. Apparently she had travelled by train and was found wandering, lost. She could give no account of her journey, but said she was looking for her sister. When she returned, her husband noticed that she did not appear to understand all that was said to her, and wondered if she had had a stroke. She would conceal an old framed photograph of herself, fearing it would be stolen, and at this time appeared to set some extraordinary value on it. Later it was demonstrated that she imagined it was a photograph of Polly. About the same time she would stand in her bedroom in front of a mirror gazing at the reflection, which she addressed as "Polly." She would spend hours in front of the mirror, and sometimes would wander from the house looking for her sister. When her husband moved the mirror she threatened to kill herself. Eventually she attempted to throw herself from a window, believing that her reflection in the glass was Polly outside. For this reason she was certified and admitted to the mental hospital, at the age of 62, two years after the death of her sister.

On admission.—Height 5 ft. 1 in. Weight 7 st. 11 lb. She was well covered and well preserved for her age, her arteries were soft, her heart normal, and her blood-

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FIG. 1.—The patient, aged 62.

FIG. 2.—The patient with beard.

FIG. 3.—The patient's sister, Polly, aged about 45.

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pressure 140/90. There were no abnormal changes in serum or cerebrospinal fluid. The central nervous system was normal except for absent abdominal responses, doubtful right extensor plantar response; all tendon reflexes were brisk, right more than left; both legs were a little spastic. As far as could be ascertained, there was no alteration in joint or muscle sense. Her vision and hearing were normal.

Speech and gnostic functions.—She could not understand lengthy sentences, and gave some incorrect answers. When fresh, at the beginning of the examination, she understood questions relating to herself and revealed that she was aware of her defects. She made certain mistakes, indicating inability to interpret the spoken word, and therefore the naming of objects was imperfect; there was some tendency to perseverate, and she employed paraphasias. There was no true agnosia and no apraxia. Objects could be identified by touch without difficulty.

Reading.—She could understand type and could read parts of sentences, but could not understand what she read beyond a few words. After reading a few sentences she became fatigued and would stop.

Pictures.—She could recognize objects from pictures. A motor car, a fountain pen, a ship, were named accurately. Descriptive pictures, such as a scene and crowds and pictures of actions, were not well understood. The patient could not grasp the whole. The single head of a woman was recognized and was identified as having been seen before when presented immediately afterwards, but the memory was not retained for more than a few moments. Pictures of young men and old were understood, with considerable accuracy. She was able to say, "That is a young man; that is an old man; I do not know that one." She showed great difficulty and much inaccuracy in judging between lines or sticks of different lengths presented to her simultaneously.

Summarizing her speech and gnostic functions, there was a mixed aphasia, sensory and amnesic in form, with impairment of judgment of large symbols and the tendency to pick out details of small portions of presentations instead of the whole. There was no agnosia. Vision and hearing were adequate for these tests.

General mental condition.—She smiled pleasantly when approached, with an evident desire to co-operate. She spoke very slowly, with a slight stammer, which became marked as the conversation proceeded. She soon became tired of the examination and then would speak no more. She admitted and explained that her memory was faulty, and that she had difficulty in finding the words for objects the use of which she understood. She said her memory had been defective for a long time, but had no means of judging how long. She thought that her speech disorder was more recent. She said she used to suffer from severe headaches, but these were now better. She thought this was at the beginning of her illness. She was not sure of her age, but said it would be about 45. She had therefore no idea of the date or the year, or her address, or present whereabouts. When alone she was restless and would wander about as if lost, touching things and evidently searching. When she found herself in front of a mirror or pane of glass, she would immediately stop, smile at her reflection, and refer to it as "Polly." She would then talk with the reflected image and gesticulate. She insisted that Polly was not dead, but that she was "at home."

Diagnosis.—A diagnosis of Alzheimer's presenile degeneration was made.

Subsequent history.—The patient failed gradually. Her aphasia developed so that communication with her became impossible, and her understanding became grossly impaired. As long as she could recognize a mirror she seemed to see Polly as before. She became bedridden and grossly demented, and died 3 years after admission.

Post-mortem.—There was gross wasting of the cortex, and histological evidence of extensive Alzheimer's change in many areas. There were no important focal lesions nor pathological changes in other organs relevant to the case.

INVESTIGATIONS.

Mrs. C—, (62), suffering from Alzheimer's disease, had a serious defect of recent memory, extending back for about 6 years. Her memory for remote events was fairly well preserved, and important early events would be repro-

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duced in their proper time sequence. There was a considerable degree of nominal and sensory aphasia, but no apraxia and no agnosia.

When presented with a mirror, the patient immediately identified what she saw as her sister, and this belief could not be shaken. She was unaware that her sister had died, as the death occurred during the period of amnesia.

The question was—what did she really see in the mirror? This was at first sight difficult to investigate, for she was quite consistent in her statements. It was necessary to ascertain first if she could recognize pictures as such, and if so whether they were correctly named or all regarded as likenesses of her sister. Various pictures were presented to her, including a strongly-lined woodcut of a peasant woman, about her age and not unlike her. She replied: "Is this a friend of yours? She is an old woman; I don't know her." It was therefore clear that she did not mistake the pictures, nor link them up with her own particular misinterpretation.

Next it was decided to change her appearance in order to test whether she recognized her sister by a factual resemblance or by a psychotic projection. She was led to the mirror, and at once began to converse with "Polly." While looking at the mirror a large beard was fastened around her chin. She began to laugh and said, "That is me with a beard" (Fig. 2). From this it was clear that by altering her appearance her interpretation of the mirror image was made immediately contemporary and realistic. The mistake was therefore a misinterpretation and not a psychotic projection. When the beard was taken off her expression slowly changed, she looked puzzled for a moment, and then said, as before, "That is Polly."

Next the beard was replaced and she was led about the ward. In a few minutes, on returning to the mirror, she looked hard and said, "That is an old man—is it father?"

From these experiments it could be inferred (1) that she no longer knew what she looked like in a mirror, because any recollection that she had of her face had long since been forgotten; (2) that when she was forced to recognize her face by the distinguishing mark of a beard, she correctly identified it in the mirror, because her appearance had been made immediately contemporary; and (3) that when given sufficient time to forget that the beard had been placed upon her, as she could not recognize what she saw in the mirror as herself, she inferred that she was looking at a bearded man, but, feeling some sort of link with the figure, she guessed that it might be her father, who incidentally in old age wore a beard.

Next she was confronted with a photograph of her sister as she had been at about 45–50, that is, at about the latest date before the patient's memory defect developed, and when she might have had a clear memory of her own appearance. On being presented with the photograph she said, "This is me." As will be seen from photographs (1) and (3) the patient normally parted her hair on the opposite side from her sister, so that in her mirror image the parting would be in the same direction.

It must be inferred, therefore, that although the patient did not realize what she looked like at the time of examination, she retained a sufficiently clear recollection of her appearance at about 45 to enable her to recognize

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as herself a photograph of her sister at this age, whom she very much resembled.

Discussion.

This case demonstrates the commonplace fact, which is so often overlooked, that as, unlike inanimate objects, human faces and appearances change with age, it is necessary constantly to refresh the memory of appearance to bring it up to date. Quite normal people feel surprised and even hurt that they have difficulty in recognizing photographs of themselves—regarded as good likenesses—which were taken some years previously. To an even greater extent they have difficulty in identifying their friends. What we believe we know of our external appearance is in fact what we remember from the latest time we have observed it. Further, the latest observation extinguishes previous images, so that we are unable to visualize easily what we looked like at previous periods in our life.

In the recognition of others we depend on accessory senses, such as sound, even smell, and our emotional attitude often predetermines recognition of a subject imperfectly perceived, who perhaps may be misidentified. An attitude of expectancy facilitates identification, so that in normal life mistakes are frequently made, as for example in addressing strangers when waiting on a railway platform. In the recognition of others, perhaps as great a part is played by recollection of patterns of movement as of actual spatial form.

From early days and in primitive people the mirror has been concerned with magic. Women in particular credit the mirror with significance, perhaps even magical powers, and the ability to reveal truth or to flatter. Mirrors in folk-lore are asked not only to tell the owner what she is like, but to make true reflections of matters further afield and even of the future. It is unlucky to break a mirror, and in some legends the shadow or soul of the individual can be trapped and taken away by a magic mirror, as in the legend of Hoffmann.

The mirror in use is not regarded as such. The mirror-gazer looks at what she sees in it and not at the mirror as an object. It is probably for this reason that an agnosia for a mirror is practically impossible without an agnostic failure to recognize at all the person seen within.

As in the cinema, once a sufficient emotional rapport is developed with the image, and this of course is inevitable with a mirror in which an individual perceives herself—the illusion of reality is accepted and the setting is forgotten. The stronger the emotional rapport, the more realistic is the illusion.

In the case of this patient the mirror image was endowed with the strongest emotional qualities for her, so that its reality was accepted immediately it was recognized as her sister, who had acted the role of a parent to her—an attitude not shaken by her marriage, in which the husband played an inferior part. The reality of the mirror situation was accepted as strongly as the screen illusion in a cinema.

A somewhat similar situation is reported by Klein (1928), in which a senile man failed to recognize or identify the image he saw in the mirror, but it was

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apparently such a pitiful object that he would make sympathetic gestures to it and then go round behind the mirror to offer it tobacco and sweets.

In the case described perception was impaired, and there was no evidence that she noticed the other objects in the mirror, which served as a background to her reflection. This is in keeping with the results of testing, in which she could pick out details but not grasp complicated wholes.

Recognition was certainly facilitated by a constant expectation that she would soon see her sister, and, as she had forgotten her own appearance, it was easy for her to identify as her sister a woman older than she remembered herself to be, whose movements and facial expressions were probably similar.

Many people feel that reflected images are the true likenesses of themselves and reversed photographs seem less true, so that if the mirror can be disregarded and the image alone perceived, this image would seem to have actual existence, as in the case of this patient, who was incapable of attending to and comprehending the total situation of the mirror, its frame, and the less emotionally interesting objects within, at the same time as the reflected image.

The individual encountered in the mirror must have been either a real person or a reflected image of the patient; the latter was impossible because it did not resemble the younger woman the patient believed herself to be. It was therefore interpreted as someone else, familiar and easily recognized, and the only person with the requisite specifications—visual and emotional—was the dead sister.

It is questionable whether there exists a true agnosia for a mirror apart from an apraxia. A patient might be unable to recognize an actual mirror frame, but, as long as she is able to recognize a reflected image, it must be assumed either that she recognizes the use of the mirror and therefore what it is (having neither mirror agnosia nor apraxia), or else that she fails to recognize herself, which is almost impossible without a gross disturbance of the body scheme and inability to preserve a conception of self, apart from the specific type of situation described here; such a set of conditions is extremely rare.

In this case the operation of several factors must be assumed, namely: severe but localized loss of recent memory; inability to accept the loss of a sister who meant more to the patient than her husband, herself, or anyone else; a restriction in interest and activity consequent on generalized cortical loss, common to all cases of organic dementia, with reduction in ability to make critical evaluation of reality; and a constitutional factor.

The early history showed an abnormal dependence on others and a marked family tendency to psychotic reactions, with, no doubt, in the various cases of schizophrenia amongst near relatives, a tendency to the easy formation of ideas of reference and psychotic projection.

The constitutional factors were most important in producing the special mirror agnosia, which developed primarily from organic brain change, but which would not occur in the absence of multiple factors and a psychotically-disposed constitution. This accounts for the rarity of the picture.

The phenomenon appeared with clarity and was susceptible to analysis, because there were no apractic or agnostic defects, and at first only a relatively small degree of aphasia.

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Summary.

In a case of Alzheimer's presenile degeneration, with amnesia for recent events and some aphasia, the reflected mirror image was persistently identified as a sister who had died after the onset of the organic brain process. The mental mechanisms have been discussed, and it has been demonstrated that inability to remember her appearance allowed the misinterpretation to be made. Reasons for the extreme rarity of misinterpretation of mirror image have been suggested.

Reference.

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CONTRIBUTION TO THE DRESSING DISABILITY AS A FOCAL SIGN AND TO THE IMPERCEPTION PHENOMENA.

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INABILITY to dress oneself is a rare symptom in focal brain lesions. We have observed it in two cases, a tumour expanding between the cerebral hemispheres, and a case of head injury in which the mental condition was sufficiently intact to allow a detailed analysis. In discussing the imperception phenomena of the tumour case, we have referred to certain others of relevant interest.

CASE 1.—G. R—, aged 42, shop manager, married, no children, gave the following history: About five weeks before admission he noticed a tendency to knock into objects on the left side of his body; he felt he was clumsy, and wondered if it was because of overwork. One evening he was found wandering in the city, unable to decide which way to go. He stated that he had become lost, although the district was absolutely familiar to him. He was brought home and was apparently well enough to return to work next day. He became slow in dressing, and his wife noticed that he put his coat on back to front or got his arms into the wrong holes. He said that he did not know in what position exactly his clothes were or how to put his hands into the arm-holes. Three weeks later a weakness of the left hand developed. It was observed by others He said he had lost feeling and that he had to think sometimes to decide whether the arm was his own. There was a clammy, numb feeling of the left hand, especially when he put it to his face. He thought power was normal, but stated that he had difficulty in picking up objects with the affected hand. About a fortnight before admission he complained one morning of a severe headache and of being sick. He saw double. He remained in bed and could not go to work. Examined in his house, he had great difficulty in moving in bed, he was unable accurately to put on his pyjama coat and there were other organic signs to be described later. He was accordingly admitted to the Mental Hospital. At that time there was no sign of intellectual defect or clouding of consciousness. Previous history was not significant. He was stated to have had a nervous breakdown eight years before, due to anxiety and overwork. He was a right-handed man who had enjoyed good health; his hobby was painting; his intellectual attainments were above average.

On admission: Clinical examination of C.N.S.—Corneal reflex, left less than right; right eye did not reach the maximum position to the right; tongue deviated slightly to the left. Muscular power in left arm was paretic; muscular power at all joints diminished; there was paresis of left leg, less marked than in the arm, more marked in muscles of the large than small joints of the leg. Muscle tone in limbs was not increased; left arm felt heavier when lifted passively. Deep reflexes were brisk and equal; Meyer's reflex present in left. Wartenberg positive on left. Left abdominal reflexes slightly less than right. There were no other pyramidal signs. The gait was hemiparetic, with a tendency to fall to the left. Discrimination of pain and touch were impaired in the left hand only. Localization of touch was less precise in the hand than in other parts of the left arm and left trunk; it was fairly precise in the left leg. The sense of position was absent in all joints of the left arm and diminished in the left leg and toes. Confrontation tests showed left-sided homonymous hemianopia.

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He showed great difficulty in naming and pointing to the fingers of the left hand, and made occasional errors with the fingers of his right hand and that of the examiner. When the examiner's hand was placed fingertip to fingertip with the patient's left hand, he was often uncertain as to which was his own and which was the foreign hand. There was no apraxia for handling objects or expressive movements with right hand.

The severe paresis made it impossible to conduct this examination adequately on the left hand or to investigate the dressing disability. His drawing, though still showing signs of skill, was incomplete and dislocated; sometimes it was quite incomprehensible when he drew lines and curves without formal content. He would frequently pass objects in the left visual field in attempting to point to them or grasp them, but the error was not constantly in one direction. There were no mistakes in estimating absolute and relative distances. The orientation on the map was good. He found great difficulty with even simple jigsaw puzzles; his performance had no plan, and he took no advantage of the shape of the piece or composition of the picture.

There was no difficulty in recognizing pictures or objects, or interpreting situations depicted. He read well. There were no aphasic disturbances. He could write faultlessly and recognize and name colours. His ability to calculate was intact. When questioned about the paralysed left hand he did not seem to find there was much the matter with it, and when asked to show the left arm he pointed as a rule to the right arm, but made no such mistakes when concerned with other parts of the body.

Progress.—The history and symptomatology pointed to a tumour of the right parietal region. Accordingly the patient was transferred to a neuro-surgical unit. He became rapidly worse, and five days later there was an almost complete paralysis of the left limbs and atrophy of the interossei and thenar muscles of the left hand. The eyes deviated to the left. There was definite bilateral papill-oedema. The finger agnosia and attitude towards the left arm remained the same. The patient died two days later.

Post-mortem findings.—On cutting the dura there was a tumour loose between the two hemispheres. It was the size of a small apple, with a number of nodules of greyish colour and hard consistency. On sectioning, it appeared that the loose tumour represented an extra-cerebral outgrowth connected with an intra-cerebral portion by a thin connecting band which had been torn at post-mortem. The extra-cerebral portion was in contact with the right most posterior parts of the cingulum and precuneus just above the splenium in front of the parieto-occipital fissure.

The extension and damage to the brain substance of the intra-cerebral part were studied in cross sections. This showed occipitally frontalwards that the right posterior horn was completely obliterated by a soft mass of tumour tissue infiltrating the occipital lobe, mainly towards the medial surface and here extending close to the grey matter of the cortex (Fig. 1). In the next two sections the tumour, infiltrating towards the convexity, destroyed the white matter of the angular gyrus and the posterior part of the supramarginal gyrus, but left the white matter close to the cortex macroscopically intact. The tumour infiltrated basically the splenium of the corpus callosum, and a thin band connected the extra- and intra-cerebral parts of the tumour.

The thalamus posteriorly was completely isolated from the cortex; the projection fibres were destroyed. Its ventricular surface was flattened and compressed, the vertical diameter smaller, the horizontal larger, than on the left side. There was a wide communication between the temporal horn and the posterior part of the lateral ventricle. The basal convolutions on the right appeared distorted upwards to the level of the thalamus, the cornua ammonis being higher. Thus the vertical diameter of the right hemisphere appeared in these sections to be much smaller than the left (Fig. 2).

On section the tumour was brittle, with wide areas of softening. Stained with haematoxylin-eosin, it was cellular with little stroma and vascularization. It consisted of cells of epithelial type forming pseudo-rosettes, with areas of less differentiated cells of varying shapes and deeply stained nuclei. Faintly-stained nuclei packed close together were seen in the softened areas. The muci-carmine stain was negative. The tumour belonged to the malignant ependymoma group (Kernohan and Fletcher-Kernohan, 1935).

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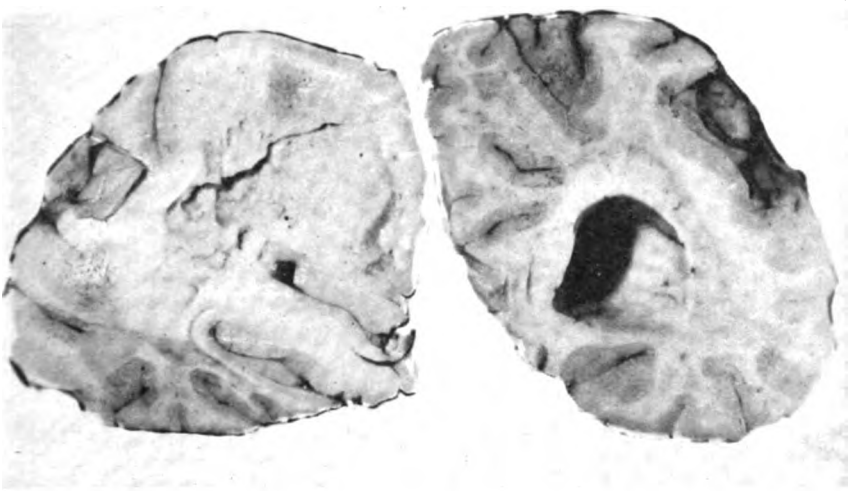

FIG. 1.—Cross-sections through each hemisphere, showing the intra-cerebral portion of the tumour obliterating the right posterior horn and infiltrating towards the occipital cortex.

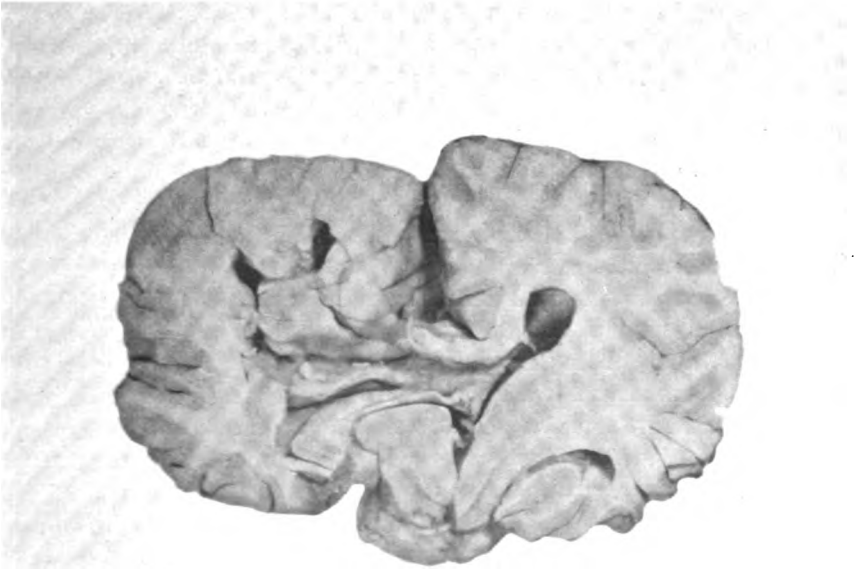

FIG. 2.—Posterior portions of the right thalamus are severed and the right corpus callosum destroyed. Indentations on the medial surface of the right hemisphere indicate the position of the extra-cerebral portion of the tumour.

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Tumours extending from the posterior horn through the corpus callosum into the interhemispheric space are rare. The extra-cerebral portion was not likely to produce clinical symptoms in its position. It must have grown for a considerable time before the intra-cerebral portion began to infiltrate, thus accounting for the late onset of symptoms and rapid final course.

There were two phases in the clinical course, separated by about three weeks. In the first there were local symptoms: left-sided hemianopia, spatial disorientation and dressing disability, but without signs of mental or other physical illness, and no evidence of increased intracranial pressure.

In the second phase pressure symptoms appeared, with slow cerebration, loss of interest, decreased attention, poor memory and retention and fresh focal symptoms. There were left-sided hemiparesis and hemihypaesthesia, maximum in the left arm, loss of sense of position in the left arm, imperception of the defect of the left side, with tendency to neglect the left arm, inability to distinguish the left hand from a foreign hand, and inability to draw; with finally atrophy of the small muscles of the left hand and deviation of the eyes to the left.

There are few reports on dressing disability in focal lesions. Marie, Bouttier and Bailey (1922), described planotopokinesis, with difficulties in dressing, disturbance in fine finger movements, disorientation on the map, acalculia, and spatial disturbance of writing; there were some disturbances of body space (Head test). There was no apraxia, no visual disturbance, no disorientation in space.

There was a similar symptomatology in a second case. Marie *et al.* (1922) regarded the basic disorder as a defect of spatial representation.

Kroll and Stolburn (1933) described dressing disability in a case with left-sided hemiparesis and hemihypaesthesia, defective attention in the left visual field without hemianopia, object apraxia, disturbance of writing and drawing, space disorientation and acalculia. These authors considered apractic disorder as the common factor.

Klein (1933) has described a case with dressing disability in a complex setting of aphasia and apraxia.

A case described by Alajouanine, Thurel and Ombredane (1934) presented difficulties in dressing, a left-sided homonymous hemianopia and disorientation in space and time. This patient was not aware of the existence of his left arm, although movements were intact, and showed astereognosis and apraxia in the left arm only, agraphia, almost complete alexia and inability to draw. These authors postulate a special type of somatagnosia of the left arm, combined with spatial disturbance—the planotopokinesis of Marie.

Lhermitte (1937) reported two cases of inability to dress, one accompanied by apractic-constructive disorders, the other by agraphia and autotopagnosia for the left side of the body and apractic disturbance in expressive movements. He assumed interruption of connections joining kinaesthetic and visual with psychomotor functions, without disturbance of spatial conception.

Brain (1941) described two cases, and referred to two cases reported by Jackson (1876) and Wendenburg (1909). In Jackson's case there was a right-sided temporo-parietal tumour, with left hemiplegia and imperception,

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and spatial disorientation with good topographic memory. In Wendenburg's case there was a tumour in the right occipital lobe; there were visual object agnosia, spatial disorientation, and difficulty in dressing.

In one of Brain's cases it was reported that, following an injury of the left superior parietal lobe, there were aphasic disturbances, acalculia, right-left disorientation, feeling of strangeness of the right half of the body and visual disorientation in the right homonymous half-field. In the second case there was a tumour of the right parieto-occipital region, producing dressing disability, with left-sided homonymous hemianopia, dysaesthesia and left allaesthesia, loss of position on left side, spatial disorientation, with neglect of left half of the external space.

Brain concludes that inability to dress may be a special apractic disorder, closely related to disorders of one half of the body; a lesion in either hemisphere disorganizing the body-scheme might produce it.

Our second case is similar to that of Brain:

CASE 2.—A. B—, aged 32, incurred head injury and was admitted to hospital after several hours of unconsciousness. Apparently he was completely blind, paralysed on left side, and had difficulty in expressing himself. He regained sight in a fortnight; had difficulty in reading for several months more; his speech improved at about the same time, and there was some improvement in paralysis.

When examined by us two years after the injury there was a left-sided paresis and hemihypaesthesia, most marked in the hand; loss of position sense in left fingers and hand, diminution in other joints of the left arm, and slight disturbance in the small joints of the left leg. There was astereognosis in the left hand. There were left-sided homonymous hemianopia and marked constriction of the right field.

The patient reported difficulty in dressing and in spatial orientation and a strange feeling on his left. He stated that for several months after the accident he would lose himself in familiar places, and did not know which way to go on routes he formerly knew well. There was no difficulty in recognizing buildings and landmarks, and he was always able to orientate himself in hospital and in his own house.

Two years after the accident, when we examined him, this disability had improved and he rarely had to think which way to go. He noticed on waking a feeling that his left arm did not belong to him, and occasionally would forget to fit his shirt over his left arm. There was always a feeling of unfamiliarity in the left arm.

Dressing disability: He had great difficulty in dressing himself. He could not do it at all without first laying out shirt, coat, and trousers. This preparatory act was a serious problem. He would turn his clothes round and could not make up his mind which was the front and back, and when he did put on a garment he often put it on the wrong way. This improved some time after the accident, but some disability remained; he had difficulty in deciding which was the right and which the left shoe, and often put his shoes on the wrong feet.

He had lost much of his skill as an engineer. He found it difficult to put together parts which had been taken to pieces, and simple automatic manipulations with instruments would often cause difficulty.

There was no disorder of speech; no alexia or agraphia; visual gnostic functions for objects, pictures of objects, and situations in pictures were intact. His history did not indicate that visual apperception had ever been impaired. Colour naming and sorting was done quickly and accurately. He estimated relative and absolute distances well. There were no errors in pointing to various areas of the body, and right-left orientation of the body was unimpaired. There was no apraxia for ordinary objects or in expressive movements. Calculations were made slowly but accurately. Free-hand drawing and copying of geometric figures (Abelson) were defective. Drawing a hand, he put the little finger at the same distance

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from the other fingers as the thumb; drawing a face he could not put the different parts in correct relation to the others. Copying was laborious and inaccurate. He was slow in doing jigsaw puzzles, but could do even complicated puzzles by considering every step carefully. Orientation on the map was difficult; at first he did not know where to look for a place, and then became confused between east and west.

Summary of the case.—Two years after a traumatic lesion involving the right parieto-occipital region and possibly left visual area there were left-sided hemiparesis and hemihypaesthesia, left-sided hemianopia, a feeling of strangeness and occasional ignorance of left arm. There were constructive disorders, difficulty in spatial orientation, and marked difficulty in dressing. It appeared that the fundamental disturbance was of visual-spatial character. He failed to differentiate sufficiently between the geometric elements in objects and was therefore unable to relate objects with regard to their shape; whenever the situation required adjustment of two objects with details of their shape, difficulty arose. This explains the constructive disorder and difficulty in dressing. The defect in visualizing objects, with the same defect in visual imagery, accounts for the disturbance in space orientation and free drawing. This disorder is similar to geometric agnosia (Pötzl), but not confined in these cases only to abstract figures.

All the reported cases show that there is much variability in the symptoms that accompany disability of dressing, but prominent are apraxia and visual agnosia, especially of spatial character, and disturbance of body scheme. In the complex act of dressing, garments that belong to outside space have to be incorporated in the body scheme by a kinetic formula. Adequate apperception is necessary. Relations between body and outside space have to be so established that body shape can be related to the shape of the garment, and appropriate movements have to be carried out to transfer from one space to the other.

In both our cases there was a spatial-agnostic defect. In the first case there were spatial disorientation and dressing difficulty; in the second, disorientation, constructive disorder and confusion in dressing, due to defective recognition of geometric details and the spatial signs of an object. In both cases the right non-dominant hemisphere was involved. The predominance of lesions in the non-dominant occipital lobe in spatial disorientation is thus related to disability in dressing when there is a visual-spatial defect.

In the second stage in the development of the first case the patient treated the paralytic side in two different ways; he overlooked the left side and reacted as if it were absent, but was unable to realize its functional loss. Two types of imperception phenomena can be distinguished: unawareness of the defect (anosognosia, Babinski), and neglect of or amnesia for the defective member. In the first, the defective member is fixed in its pre-morbid condition in the body scheme, in the other excluded from it. These two attitudes would appear to exclude each other. In our case the left half of the body seemed to be represented in the body scheme in both ways.

CASE 3.—The same paradoxical attitude was found in the following case: A 77-year-old senile, with severe memory loss and some tendency to confabulate, showed, after an apoplectiform seizure, deviation of eyes and head to the right with loss of conjugate eye movements to the left, absent lid-blinking reflex on the left, left-sided hemiplegia and hemianaesthesia and loss of position-sense of the left joints. When asked to point to parts of the body, she never passed her intact right hand above the midline to the left, but made no mistakes when pointing to parts of the right half of the body. She was unaware that her left side was

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paralysed. When the left arm was brought into her visual field and she was asked to move, she made movements with her right hand and would not realize that she could not do so with her left. She also related that she took walks when actually she was lying helplessly in bed. A few days later the deviation of eyes and the paresis of conjugate eye movements disappeared; she was able to make slight movements of her left shoulder and elbow and ample movements of ankle and toes. Position-sense in arm was still absent. There was complete anaesthesia at first; later she localized on the chest stimuli applied to the arm. Sensation in other parts of the body was normal. She could point to all parts of the body on the left side, and only occasionally showed a tendency to point to the right instead of the left. She was, however, as before, unaware that she was unable to move the paralysed limbs.

After a fortnight the patient died. The brain showed a moderate atrophy of both frontal poles, the right hemisphere was somewhat smaller than the left, and there was a softened area on the surface of the convexity extending from the posterior end of the right inferior frontal convolution to the angular gyrus. In frontal sections damage was most severe in the transition area of the inferior frontal lobe and precentral gyrus, where it extended deeply into the white matter close to the striatum. In posterior central, supra-marginal and angular gyri the gross damage was confined to the cortex and the white matter close to it; the thalamus and its peduncles appeared intact.

In this case the deviation of head and eyes to the side opposite to the hemiplegia seemed to have been a factor in the imperception phenomena: with disappearance of the deviation, the patient became again aware of the left half of the body previously neglected, although she still could not realize it was paralysed. Turning away from the affected side, mentioned in several cases in the literature (Kramer, 1914; Pötzl, 1926; Hagen, 1937; Brain, 1941), introduces a visual-spatial element into the imperception problem. Attention has been drawn by Brain (1941) to such visual-spatial relations. This author reports three cases in which unawareness of one half of the body was associated with neglect of the corresponding half of the external space, and he points out that body image and outside space are closely connected anatomically as well as functionally. Anatomically, the lesion which causes both these disorders is situated between the visual and the postcentral area; functionally, an object of the external space has no meaning except in relation to the body scheme.

These relations are, however, not one-sided. Body parts (and this applies especially for the limbs) are in two ways related to the external space: though body-bound, they are part of the outside space, and as tools of the body they are functionally oriented towards this space. When we move the arm from the limp position into extension forward, we have changed the position of the arm towards external space as well as towards body. Both these relations are contained in the normal image of the body, and have to be continuously registered under control of visual and positional sense.

The third case here reported suggests that such spatial factors were involved: the interrupted contact, the virtual abolition of the left half of space, which includes the left half of the body, caused by a combination of deviation and hemianopia, were the ultimate cause of the neglect of this half; the complete loss of sensory perceptions from the left half of the body deprived our patient of all perceptive sources from which to be aware of this side.

This case shows that the unawareness of the hemiplegia was conditioned by factors different from those which caused the neglect phenomenon, for

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when the patient had become aware of her left side she was still unaware of the hemiplegia. What special conditions might underly the imperception of the defect is indicated by the following case :

CASE 4.—A woman, aged 35, with bilateral optic atrophy for 15 years, was blind for 14 years. Later the lower limbs were immobilized by advanced ataxia. She was mentally intact until just before her admission to hospital with taboparesis, and was fully aware of her condition.

Neurologically there was loss of deep reflexes, impairment of positional sense in the lower limbs, and severe ataxia, which made standing without help impossible. Mentally there was intellectual deterioration of Korsakoff type.

The patient would admit neither blindness nor inability to walk ; she maintained she could see, and would describe persons or objects which she believed confronted her. She showed the same attitude towards her motor defects ; she reported walks she took, and denied consistently that there was anything wrong with her legs.

In this, as in the case described by Stengel and Steele (1946), intellectual defect superimposed upon a chronic functional loss caused the phenomenon of unawareness.

In these cases certain points are significant. With the same anatomical lesion, unawareness of defect as well as elimination of the defective side may be present (Cases 1 and 3). One of these phenomena may disappear, the other persist, after partial restitution of function (Case 3). Case 4 shows that unawareness of a longstanding defect may appear only when intellectual deterioration is advanced. Case 3 demonstrates the relative independence of this phenomenon from the physiological condition.

In all cases loss of perceptive functions is the most important factor in the neglect phenomenon. The extent and intensity of this functional loss will decide whether a sense of strangeness or occasional forgetting of the affected side appears, as in our Case 2, where the neurological defect is moderate ; some neglect of the affected side, as in our Case 1, where the functional loss is considerable ; or total neglect, as in Case 3, where the perceptive loss is complete. Strangeness, occasional forgetting and neglect are variations in degree of the same disorder. They represent errors in ability to construct an image of particular parts of the body by perceptive means ; alteration and reduction of the respective perceptions reduce the capacity to evoke an appropriate picture and feeling of reality for parts of the body.

On the other hand, unawareness is not due to faulty perceptions, and the construction of the body image is not involved. It is not the particular parts of the body, but their functions that are experienced abnormally. The functions concerned, moreover, can be of quite different order ; the phenomenon can be seen in peripheral or cortical blindness, in aphasia, in hemiplegia. Different functions (visual and locomotor) can be involved simultaneously, indicating a more general disturbance. Case-reports in the literature (Redlich and Bonvicini, 1914–5 ; R. Klein, 1924 ; Pötzl, 1923 ; Hagen, 1937 ; Klein and Mallie, 1945 ; Redlich and Dorsey, 1945 ; Stengel and Steele, 1946 ; *et al.*) show that a general impairment of cortical functions is the rule in anosognosia.

Lesions of the parieto-thalamic region in the right non-dominant hemisphere are held responsible for imperception (Pötzl, 1923). It is thought that

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the right parietal region integrates sensory perceptions (Pötzl, 1923; Nielson, 1938–40), and the imperception phenomena appear when sensory stimuli are prevented from reaching this part of the brain. All the cases cited and all ours are in agreement for the neglect phenomenon. As corresponding lesions of the left dominant hemisphere do not produce the same disability, it would seem that such integrating functions exist for the left half of the body only and not for the right, which is certainly difficult to understand.

There are two possible reasons for the rarity of imperception phenomena in left-sided lesions: the particular site of the lesion which generally causes these phenomena, and its transitory character. As lesions of the left thalamo-parietal region are usually complicated by aphasia and apraxia, imperception phenomena will be difficult to demonstrate, as this requires understanding and co-operation. The transitory character becomes important under these conditions, for the phenomena may have disappeared at a period when the complicating symptoms have so far improved as to permit proper investigation. Close observation may sometimes indicate imperception phenomena even in the initial stages of lesions in the left hemisphere, as the following case shows:

CASE 5.—A patient, aged 56, who suffered from general paralysis of the insane, had an apoplectiform seizure producing right-sided hemiplegia, hemi-hypaesthesia, and total aphasia. His speech became almost inarticulate, and there was little understanding of the spoken word. He had a tendency to clasp the right paralysed hand in front of him. When the right hand was passively abducted and he was asked to show his right hand, he made unsuccessful grasping movements in front of him as if the hand were still there. He never turned eyes or head to the right in order to bring the right hand into his visual field. If, while his own hand was passively held to the right, the examiner's hand was put before him, he clasped it in the same way as he did his own right hand, apparently in the belief that it was his.

He died six weeks after the seizure. The brain showed moderate atrophy of both frontal lobes. A softening destroyed almost completely the 1st and 2nd left temporal convolutions in their entire length, extending backwards into the supra-marginal and angular gyri and the bordering occipital convolutions. On cross section a small area of softening was seen in the head of the caudate nucleus, and a strip-like softening in the white matter of the posterior central gyrus which extended towards the internal capsule. There was otherwise no damage to the deeper layers of the white matter; the thalamus and its cortical peduncles appeared to be macroscopically intact.

There was therefore in this case of a left-sided lesion in a right-handed person an abnormal attitude towards the paralysed right arm with a neglect of the limb. There is therefore evidence that the theory that lesions of the right inferior hemisphere are specific for imperception phenomena is not entirely sound.

Nielson, in elaborating Pötzl's supposition, assumed that there are different anatomical localizations for the anosognosia and the neglect phenomenon. He is of the opinion that in cases of neglect of one half of the body the essential lesion is in the parieto-thalamic peduncle; in anosognosia either the thalamus is directly affected or it is separated from the frontal, parietal and temporal lobes. In our tumour case the parieto-thalamic peduncle was destroyed, while all other thalamo-cortical fibres were intact. This agrees with Nielson's assumption concerning the neglect phenomenon, but not as to the anosognosia

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which was simultaneously present. In our third case, in which both imperception phenomena were present, there was widespread damage of cortical areas, with little involvement of subcortical layers and macroscopically intact thalamo-cerebral peduncles; this does not agree with what Nielson expects, either in anosognosia or in neglect of one half of the body. There is no support for Nielson's theory in the anatomical findings of the last case.

Our own and published observations suggest the following conclusions: Unawareness of a defect can occur whenever deficiency or loss of function appears. It is due to a general impairment of cortical functions, which can be caused by a variety of generalized processes. The unawareness of a hemiplegia is no exception; there is no evidence that the focal lesion by itself leads to this phenomenon.

The phenomena of strangeness and neglect of one half or parts of the body are pathophysiologically conditioned, and due to loss of perceptions which normally are used for realization of these particular parts and for construction of an image of them. It may be that this integration takes place in the parieto-occipital region. As in the parieto-thalamic area the fibres conducting elementary perceptions of one half of the body are concentrated, lesions in this region are bound to be important in disorders of the body scheme. The clinical experience that neglect and kindred phenomena are mainly seen in lesions of this area is therefore no proof of specificity of the parieto-thalamic region, nor is there enough evidence that the right non-dominant hemisphere has a special significance.

In anosognosia, presumably due to a generalized process with lowering of mental capacities, the patients are unprepared to face the defect, and there is a tendency towards fixation of the pre-morbid body image. In the neglect phenomena, due to a circumscribed functional loss with preservation of functions at a higher level, the tendency is to eliminate the useless body parts from the body scheme.

In Case 1, at the period when the imperception phenomena were found, difficulties in drawing and finger-agnosia were present. The definite spatial disturbances in the drawings probably related to the visual spatial disorder prominent in the first stage of the illness. The finger-agnosia was mainly confined to the left hand; but, because of the paresis, possible agraphic or dyspractic disturbances could not be assessed. Finger-apraxia of the left hand resembles and is functionally related to the isolated dyspraxia of the left hand which, according to Liepmann, is due to a lesion of the corpus callosum. This widely-held opinion has recently been disputed, for it has been shown that destruction of the corpus callosum is not as a rule followed by dyspraxia. The observations of Akelaitis *et al.* (1941) offer an explanation for the contradiction. They sectioned the corpus callosum in 18 cases of epilepsy, and found that dyspraxia of the left hand occurred whenever the right subordinate hemisphere had been damaged before or during this operation. In our case there were lesions of the right hemisphere and of the corpus callosum; combined lesions may thus have been the cause of the left finger-agnosia.

Another possible explanation for finger-agnosia in a lesion of the right non-dominant hemisphere would be a shift of dominance, assuming that the

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right inferior hemisphere remained inferior with regard to spatial orientation, but dominant for finger-agnosia.

In a broader physiological sense, the finger-agnosia is part of a de-differentiation of the hand, which can be found (Klein, 1932–3) in parietal lesions at all functional levels. Expressing this, there arose in Case 1 a paralysis, a sensory loss of the hand, inability to distinguish the hand from a foreign hand, a tendency to eliminate it from the body scheme, and finally, atrophy of the small hand muscles.

Summary.

A case has been described in which a malignant ependymoma of the right posterior horn infiltrated through the splenium, severed the posterior portion of the thalamus, and formed an extra-cerebral outgrowth in the interhemispheric space. Clinically, two stages could be distinguished, the first showing a left-sided homonymous hemianopia, spatial disorientation, and dressing disabilities, the second, a left-sided hemiplegia and hemianaesthesia, finger-agnosia and imperception phenomena.

Dressing disability and spatial disorientation were more fully analysed in a patient in which they persisted, with left-sided symptoms and tendency to neglect the left arm, after a head injury. They were related to a spatial disorder of geometric agnostic type. In discussing the imperception phenomena, the case of a senile is described in which these phenomena appeared after a seizure, together with a left-sided hemiplegia, hemianaesthesia, homonymous hemianopia, and deviation of eyes and head to the opposite side. The neglect phenomenon disappeared, whilst the anosognosia remained unchanged, after considerable neurological improvement. Autopsy showed an extensive cortical softening with little damage to the white matter; the thalamus and its peduncles appeared macroscopically intact.

In a case of tabo-paresis with severe locomotor ataxia and blindness due to optic atrophy, imperception of these defects appeared after the mental deterioration had set in.

Finally, a case of general paresis is described, in which a vascular lesion of the left hemisphere caused a right-sided hemiplegia and hemihypaesthesia, hemianopia, and a pathological neglect of the right arm.

It has been concluded that the neglect phenomena are due to perceptive loss in the half or part of the body involved, leading to defective realization and inability to construct an image of these particular parts. There is insufficient evidence to suggest that the right non-dominant hemisphere is of greater importance for the body scheme and its defects than the dominant left hemisphere. The parieto-thalamic lesion is not specific, though for physiological reasons it frequently produces this phenomenon. In anosognosia of one half of the body, construction of the body scheme is not at fault, but the main factor is a general impairment of cortical function. There is no evidence that the focal lesion which causes the unilateral neurological signs is responsible for the anosognosia.

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THE COMMUNITY AND THE AGGRESSIVE CHILD.*

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A SUBJECT such as this is much too large to deal with at all fully in a short paper. As it is designed as a preparatory review of this topic as it applies to Great Britain, the subject being dealt with at the International Congress of Mental Health by delegates from overseas, I am placing the emphasis on the community rather than on the aggressive child. It is necessary, however, to consider what the aggressive child does to the community and why, in addition to discussing what the community does to the aggressive child, and the reason for this.

A. F. Shand (1), in his *Foundations of Character*, says that when the activity of an instinct is most sudden and unopposed, the emotion, if it be brought into activity at all, will be of less intensity and definiteness. In the activity of the instinct of aggression it is well to remember that the emotional experience or tension may be quite slight. One's experience of large numbers of aggressive children is that this applies very much to most of them. Their aggressive conduct occurs without there being any strong emotional experience accompanying it. Drever (2) takes the view that the instinct-emotion is not an invariable accompaniment of instinctive activity, but is due mainly to arrest of the impulse, to the denying of immediate satisfaction to the interest. Such denying of immediate satisfaction with its resultant development of instinct-emotion is an impetus to more aggressive conduct. McDougall (3) says very truly that with all specific instinct tendencies the constant and characteristic quality is an emotional experience of a quite specific quality. The more common specific instinct tendencies, which in point of fact spring from the primary instinct of aggression and are commonly notable in the aggressive child, are anger, self-assertion, and acquisitiveness.

The question of the strengths of instinctive drives in different individuals is one about which little seems to be known. Is it analogous with I.Q. in that different individuals are differently endowed, quantitatively and qualitatively? It would seem to be so, but the way in which cerebral destruction, as in encephalitis lethargica, can release an overwhelming force of aggression points to the contrary.

The aggressive instinct subserves many socially worthy purposes. In clinical work as a psychiatrist one tends to dwell mainly on the asocial and antisocial manifestations of this instinct. Also in practice the emphasis is on the bad effects of frustration, but frustration may be a starting-point for

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many valuable aggressive reactions, and such cases naturally rarely come before the psychiatrist. It is necessary to state clearly at this point that aggressive attitudes and conduct do not by any means all spring from frustration ; in fact, only a minority do so. Much aggression is actively encouraged by the precept and practice of individual members and whole sections of the community, these being communally aggressive either in a socially good or a socially bad direction. Group membership may conduce to much aggressive activity. This may be good, as, for example, in membership of a rugby team ; or it may be bad if one is a member of a gang of thieves. But for the recent national communal aggression of 1939–1945 it is doubtful if it would be possible for this paper to have been compiled.

Such communal forces play no small part in the development of the child's superego. It is perhaps a mistake to regard a superego which approves of antisocial aggression as therefore undeveloped. It should be regarded as normally developed, though socially in a scarcely praiseworthy direction. It is not a matter of under-development but of wrong development. Examples of the latter are the many children who have incorporated the delinquent standards of their parents.

Healy and Bronner (4) say that ethical concepts which have no personification have little force in the lives of young people. This applies outside the family as well as within it. The community provides many contrary personifications, good correcting bad, and bad undermining good. The mechanisms of projection and identification are applied not only in relation to individuals outside the family, but also in relation to groups which the child finds emotionally satisfying, and these play their part in the development of his character. The most outstanding present-day instance of this is seen in German children.

A child has three main methods of expressing his aggression upon the community. The first is by truancy and vagrancy. Truancy is essentially an aggressive act in that it is a positive rejection of the demands and requirements of the community. Really serious frustration is the usual precipitating condition. Teachers as figures of authority may be the irritant ; or there are difficulties with other children ; or the school work is either too difficult or, being too easy, boring, etc. It is well to remember that many a child fails to respond aggressively to such a difficulty, and instead of truanting he suffers in silence. This quiet submission to difficulties may be thought to be a bad thing. The very fact of truancy may lead the community to perceive its mistake, and by rectifying this the child's problems may be remedied. Surely it would be better if such primary miseries did not occur at all. There is need for much more research into the interpersonal relationships and tensions within the world of school-life. Equally important is the need for application of personnel selection and job analysis techniques.

Children who run away from home are usually escaping from situations which they have found to be intolerable. This is an aggressive act, as aggression has been mobilized and thereby a solution attempted. What is the reaction of the community ? So often it insists that the child return to the intolerable situation, to which he then either submits, whereupon the community feels " it has won " ; or he runs away again, whereupon the community feels " it

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has failed." It is not unknown that a Juvenile Bench should resort to the judicial birching of such children.

Boarding schools provide their problems also. In one instance a boy ran away many times, chiefly out of dislike for the headmaster. After being returned to the school for perhaps the tenth time he was thrashed rather severely, and not unnaturally, ran away once more. Though it was advised by the psychiatrist, who happened to see him and examine the rather deep bruising, that he should not be returned to that school, the unfortunate boy was returned a day or two later. The psychiatrist's suggestion in this case was that if this policy were to be pursued, the next step, to be consistent, should be in some way to render him incapable of running away, by adopting the methods in use a good many centuries ago. That the community can be so unresponsive to the sufferings of children must be a matter of serious concern to those who have these matters at heart.

Many boys and girls live in places such as orphanages, which do not seem to produce overtly aggressive children. This is admittedly an overstatement, but one does tend to recognize their curiously submissive, uninspiring products. Perhaps society has failed to a greater degree in its responsibility when such is the result than had it produced rather irksomely aggressive children. Therapeutically it is less difficult to help a child to bring aggressive tendencies under control than it is to release aggression which has been very firmly suppressed. The question which one has to ask is what has the community done about all this.

The second main antisocial technique employed by the aggressive child is stealing. Nearly all stealing habits start in childhood. It has been said that if there were no receivers there would be no thieves: it would be nearer the truth to say that if children did not learn to thieve there would be few adult thieves. Bowlby (5) in his *Forty-four Juvenile Thieves* has focused attention on the affectionless child. His figures are, however, misleading as his cases were all highly selected in that they had been referred to a psychiatric clinic. With the common run of juvenile thief the percentage of such affectionless children is very small. This is not to suggest that they are an unimportant group, but they comprise only a small fraction of the total problem. Most juvenile thieves steal at first either by following the example of others, or as one outcome of a psychopathic or near-psychopathic state. Mental deficiency, organic disease, reaction character-trait formation, psychoneurosis and psychosis account for nearly all the others, either directly or indirectly. The great bulk of juvenile stealing is done in the company of others. In many cases the gangs are well organized, various roles are allotted and recognized leaders are in command. Adults are very often behind them, at least as receivers. In many such cases the elements of frustration for which we seek as perhaps underlying such conduct are so slight that they have but minor, if any importance.

A large toll of injury is sustained by the community at large, but the child's own community, i.e. his confederates, approve of him. Perhaps it should be said that the writer has examined a great number of juvenile thieves, admittedly some more thoroughly than others, and their conduct is usually linked

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neither with anxiety nor with self-criticism. Their one source of reproach is that they have been caught.

One may ask what the community at large does to these children. Too often it is vindictive or, at the least, unintelligent, though in many districts such as London there are imaginative and responsible sections of the community. Outstanding examples of this in London are the Juvenile Court Magistrates. Surely there need not be so many children behaving in such ways.

The aggressive child's third technique is by directly aggressive conduct, which extends from bullying, damage to property, the spreading of defamatory rumours right up to murder. Usually there are no secondary mental mechanisms involved; the conduct represents a direct outpouring of the aggressive instinct, which in no way puts the superego out of countenance. Again the question is what does the community do. An extreme example of its response was in the case of a boy 13 years old, who was charged with rape and murder, but found not guilty as the law, i.e. the community, said that, as he was not yet 14 years old, he was therefore physically incapable of perpetrating the first offence, and mentally incapable of committing the second. His response to these findings was just what one might expect.

In a short paper such as this no exhaustive analysis of the community and its influences is attempted. A superficial description of major factors serves best as a basis for later discussion and thought.

The most important elements in the community are school-life, the neighbourhood in which the child lives, civic and national attitudes and religion.

Many situations infused with aggression occur among school children, and much bullying undoubtedly goes unchecked. Many school teachers appear to be far less interested in the children under their care as children than in the task of putting them through the school curriculum. The spotlight is on academic learning. This is a subject worthy of some hard thinking.

Outside school and the home there is the neighbourhood. Some districts are good and others bad, materially, morally or both. There are streets where everyone is a thief. There are districts into which the police do not go in units of less than two. The neighbourhood may be rich in temptation, and may at the same time provide much frustration. Society so often fails to encourage the freedom of its members, and in so many ways older persons seem unwilling to allow a child to participate in their corporate life that there is little cause for wonder if the child feels thwarted and his aggression is aroused. Add to this all the other positive opportunities of and incitement to aggressive and antisocial conduct.

Civic and national attitudes with all their political strife, class warfare, tensions and strikes, so faithfully reflected in the press, by the radio and on the screen, are in many ways pernicious in their influence. The wealth of detailed factors which are active in this way need not be discussed now. It is important to remember that it is just these communal attitudes which are so liable to undergo constant changes. In a nation at war the very qualities which are condemned in times of peace are set up for emulation. It may be thought that true religious feelings and perhaps even the experience of any formal religious teaching are useful in superego development. There may be

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those who consider this to be a poor form of control, but none the less it is surely better than none. Whatever one's views, there is no escaping the fact that religion has declined and is continuing rapidly to decline as a force in the individual and communal life of this country. Coincidentally, there is a great increase in the overtly aggressive behaviour of individuals and of communities. This situation would repay exploration. Last year the entire membership of the group for Advancement of Psychiatry present at a meeting unanimously approved the statement on the relationship between psychiatry and religion, which is as follows:

"For centuries religion and medicine have been closely related. Psychiatry as a branch of medicine has been so closely related to religion that at times the two were almost inseparable. As science developed, however, medicine and religion assumed distinctive roles in society, but they continue to share the common aim of human betterment. This also holds true for that method of psychiatry known as psychoanalysis. We, as members of the Group for the Advancement of Psychiatry, believe in the dignity and the integrity of the individual. We believe that a major goal of treatment is the progressive attainment of social responsibility. We recognize as of crucial significance the influence of the home upon the individual and the importance of ethical training in the home. We also recognize the important role religion can play in bringing about an improved emotional and moral state.

"The methods of psychiatry aim to help patients achieve health in their emotional lives so that they may live in harmony with society and with its standards. We believe that there is no conflict between psychiatry and religion. In the practice of his profession, the competent psychiatrist will therefore always be guided by this belief."

The late Dr. Ira S. Wile (6) considered maladjustment in the happiness and behaviour of children to have grown out of customs, laws, regulations and ordinances, rather than wholly out of ignorance, misunderstanding and inherent frailties. In his view the main general sociological causes fall under the three headings of social sanction, social tolerance and social indifference. It is on these three main conditions that attention should be focused. They constitute a sickness of society. Society does sanction so many undesirable things. Many others which it may not go so far as to sanction it regards with tolerance: and to those which it neither sanctions nor really tolerates it is so often largely indifferent. This is the main social disease which a study of the community and the aggressive child illuminates. The field for research is vast. An excellent pilot-run would be a comparative study of the aggressive child in different communities, such as Italy, Spain, Switzerland, Sweden, the United States of America and Great Britain. The Briton's horror of what he regards as the cruelty of the Spaniard to animals is no greater than the Spaniard's horror of what he regards as the Briton's cruelty to his children. A second very fruitful field for research would be a comparative study of the influence of the impact of religion on communal attitudes, and the part religion plays in the communal consciences of a variety of nations.

In thinking about the relationship between the community and the aggressive child, one is apt to devote too much time to the problem of helping the already established delinquent child. Far more good will accrue to society if the psychiatrist will look further ahead, and will see the problem as one of positive

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mental health by helping to uncover and to devise remedies for the social diseases which permit or encourage such unproductive aggression. This will be a much greater contribution than simply to approach the subject from the point of view of an exercise in salvage.

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THE EPHEDRINE TREATMENT OF NOCTURNAL ENURESIS.

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TREATMENTS for enuresis have been legion, but several authors have recorded beneficial results from the use of ephedrine hydrochloride.

TABLE I.—*Summary from Literature.*

Author.	Numbers.	Ages in years.	Dose.	Additional treatment.	Remarks.
Parkhurst	..	10–12	½ gr. (·032 gm.)	Limitation of fluids	"Almost specific."
Christopherson and Broadbent	12	3–13	¼ gr. (·016 gm.)	..	8 controlled.
			½ gr. (·032 gm.)	Alk. belladonna	4 controlled.
Brookfield	32	Children	½–5 gr. (·032–·324 gm.)	..	10 ceased. 14 improved.
Browne and Ford-Smith	6	14–20	1–4 gr. (·06–·24 gm.)	..	3 better; 2 worse.
Stalker and Band	27	Adults	1½–3 gr. (·032–·194 gm.)	Limitation of fluids	8 ceased; 6, 75% improved; 6, 50% improved;
		Children	Less		3, 25% improved.
Kittredge and Brown	25	,,	¼ gr. (·049 gm.)	..	23 ceased.
Total	102				Improved 85 (83·4%)

Parkhurst's subjects urinated normally before and two hours after going to bed.

Christopherson and Broadbent report that of the 8 cases controlled by ephedrine gr. ¼ (·016 gm.), 7 were also controlled by gr. ½ (·032 gm.) pseudo-ephedrine hydrochloride, the eighth being controlled by gr. ¼ (·016 gm.). Of the four cases requiring gr. ½ (·032 gm.) of ephedrine with belladonna during the day, 2 required gr. 1 (·065 gm.) of pseudo-ephedrine with the belladonna and 2 only gr. ½ (·032 gm.) with the belladonna. One case improved with gr. ¼ (·016 gm.) pseudo-ephedrine, but responded completely to gr. ½ (·032 gm.). The treatment was given for from 1–4 months.

Brookfield found that months of persevering treatment were needed in certain cases before improvement occurred. Of his 17 males and 15 females, 4 of each sex failed to improve.

Browne and Ford-Smith expressed their results as a comparison with the total possible number of beds that could be wet. Consequently, their results express the number of nights wet, not the number of times that enuresis occurred. Their cases were wakened for urination two hours after going to sleep.

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Stalker and Band measured the degree of improvement on a rough percentage scale.

First eliminating organic causes, such as infection of urine, mechanical obstruction to emptying the bladder with resultant retention, and neurological defect interfering with the function of the bladder, Kittredge and Brown gave the treatment for two weeks. Enuresis re-commenced in 11 cases. These authors state that the treatment must, probably, always be given for 3 weeks, and that nightly treatment for one month may be necessary before any improvement occurs. An increase above a dosage of gr. ¾ (·049 gm.) in cases of failure produced no additional benefit. These authors record one case, a man 23 years of age and incontinent since a child, who showed no recurrence during an observation period of four years after receiving gr. ¾ (·049 gm.) nightly for three weeks. A boy, aged 9, incontinent "practically every night," showed no enuresis during an observation period of three years following two courses of treatment of three weeks each. Two other illustrative cases, each with freedom of recurrence over six months, are those of a 17-year-old female, an enuretic since infancy, who received gr. ¾ (·049 gm.) for three weeks, and a 3½-year-old boy who was given the same dose for one month. Enuresis ceased, but he was given an additional course of the same dosage for three weeks.

Present Investigation.

An investigation of the value of ephedrine in persistent nocturnal enuresis has been undertaken at Hortham Colony on a total of 90 resident mental defectives of both sexes and from 2 to 27 years of age. Although Kittredge and Brown found, by the use of sugar-coated pills substituted for the ephedrine, that suggestion plays no, or little, part in the treatment, the use of low-grade mental defectives was believed to reduce the effect of suggestion to negligible proportions.

Staff Supervision.

Clearly, the number of times that a case is found to be wet is related to the number of times that the nurse examines the sheets. For instance, a patient may wet the bed two or three times before the bed is examined, with the consequent result that one wet bed instead of two or three is recorded. The records of wet beds show the minimum and not the maximum number of times that the individual has passed urine. A good nurse who knows the patient at night will often be able to prevent a wet bed occurring by awaking the patient and causing him to micturate at the most advantageous times.

Instructions to the night staff, their knowledge of the cases and changes in staff may, in consequence, influence the results of investigations of treatment.

Investigations.

In the following investigations fluids were not restricted, but the cases were encouraged to micturate before going to bed and were awakened during the night. These practices were adopted before and during the test periods.

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Test 1.—*Small Dose.*

Cases: 30 males, 12 females, from $2\frac{8}{12}$ to $18\frac{3}{12}$ years of age; 38 idiots, 2 imbeciles, 2 feeble-minded.

Incontinence: All incontinent every night.

Staff: All cases nursed by same staff. Instructed to record number of times wet nightly.

Dose: Gr. $\frac{1}{2}$ (·032 gm.) between 6 and 7 p.m. nightly for 4 weeks. Records for 3 weeks.

Test 2.—*Medium Dose.*

Cases: 17 males from $10\frac{8}{12}$ to $23\frac{9}{12}$ years of age; 11 idiots, 5 imbeciles, 1 feebleminded.

Incontinence: Observation for 2 weeks before treatment.

Staff: One nurse, who knew all cases thoroughly, during test.

Dose: Gr. $1\frac{1}{2}$ (·097 gm.) at 5–6 p.m. nightly for 12 weeks.

Test 3.—*Doses Varying from Low to High.*

Cases: 11 females from 17 to 26 years of age; 1 idiot, 9 imbeciles, 1 feeble-minded.

Incontinence: Observed for 2 weeks before treatment and continued for 2 weeks after cessation of treatment.

Staff: Accustomed to the cases. Instructed to examine frequently.

Dose: Gr. $\frac{3}{4}$ (·049 gm.) to gr. $2\frac{1}{4}$ (·146 gm.) nightly, from 6–7 p.m. for 16 weeks.

Test 4.—*Test of Effect Early or Late in the Night.*

Cases: 21 males, 12 females from $2\frac{2}{12}$ to $26\frac{11}{12}$ years of age. Twenty of these cases were not included in Tests 1, 2 and 3.

Incontinence: Not cured by ephedrine.

Staff: Instructed to examine cases before and after midnight.

Dose: Gr. 1 (·065 gm.) or 2 (·13 gm.) nightly for 8 to 11 nights.

Results.

Test 1.

During the test no alteration was made in the routine examination and raising of the patients. The results were recorded continuously during the first, second and third weeks of treatment in 21 males and 11 females, and during the first, third and fourth weeks in 9 males and 1 female.

The number of nights on which the cases were incontinent was, as compared with the period previous to treatment, reduced in 21 patients (50 per cent.) and stationary in 21 cases. Of the 30 males, 18 (60 per cent.) improved, but of the 12 females only 3 (25 per cent.) improved.

The number of times that each child was wet weekly decreased from the first week of treatment in 26 (61·9 per cent.) cases, remained stationary in 5 (7·1 per cent.) and became more numerous in 11 (26·2 per cent.).

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Of the 30 males, 18 (60 per cent.) showed improvement, 4 (13 per cent.) remained stationary and 8 (27 per cent.) became worse. Of the 12 females, 8 (67 per cent.) improved, 1 (8 per cent.) showed no change and 3 (25 per cent.) deteriorated.

Only two patients, a feeble-minded boy, aged $6\frac{8}{12}$, and an idiot boy, aged $2\frac{1}{12}$, became completely continent during the three weeks of treatment. Two cases, an imbecile boy, aged $11\frac{6}{12}$, and a feeble-minded boy, aged $5\frac{4}{12}$, were completely continent for two of the three weeks.

Test 2.

In view of the failure of many cases to improve on the small dose given in Test 1, a test of three times the dose was carried out.

Although the nurse on duty throughout this test knew the patients well, no ephedrine was given for the first two weeks.

With regard to the number of times wet, 8 (47 per cent.) showed definite improvement, 3 (17·6 per cent.) showed doubtful improvement, 1 (5·9 per cent.) remained unchanged and 5 (29·4 per cent.) became worse. Only 2 cases became completely continent, both being so for one month of treatment. Of the 17 cases, 7 (41·2 per cent.) showed a decrease in the number of nights of incontinence, 2 (11·8 per cent.) showed a doubtful improvement, 7 (41·2 per cent.) showed no change and 1 (5·9 per cent.) became worse.

Six cases showed a marked temporary improvement, both with regard to the number of times incontinence occurred and to the number of nights on which incontinence took place. This temporary improvement persisted from 4 to 10 weeks after the commencement of the treatment. It occurred in cases who showed improvement at the end of the treatment, cases who remained stationary and those who had become worse by the end of the test period.

Test 3.

In this test no ephedrine was given for the first two weeks. During the third and fourth weeks gr. $\frac{3}{4}$ (·049 gm.) was given. At the beginning of the fifth week the dose was decreased to gr. $\frac{1}{2}$ (·032 gm.) in 5 cases and increased to gr. 1 (·065 gm.) in 6 cases. The doses were maintained at these levels during the sixth week. At the commencement of the seventh week all doses were increased by gr. $\frac{1}{4}$ (·016 gm.), and a similar increase was made at the beginning of the 9th, 11th, 13th and 15th weeks, a dosage of gr. $2\frac{1}{4}$ (·146 gm.) being given to 6 cases during the 15th and 16th weeks. No treatment was given during the 17th and 18th weeks.

With regard to the number of nights on which wet beds occurred, 2 imbeciles showed no improvement on any of the doses given, these two reaching a dosage of gr. $2\frac{1}{4}$ (·146 gm.). The remaining 9 cases improved, one for 12 weeks only and another for 8 weeks only, in spite of the continuance of the ephedrine. Seven cases (63·5 per cent.) maintained their improvement even during the final two-week period with no treatment.

The number of times that wet beds were found decreased in every case, although in the two imbeciles showing no improvement in the number of

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nights wet, the reduction lasted for 12 and 14 weeks only. In a third case, an idiot, the improvement ceased after the cessation of the treatment. In the remaining 8 cases (one died earlier) the improvement persisted during the two weeks following the termination of the treatment, although the degree of improvement became less. No case became worse.

The increase of the dose, up to twice its initial strength, did not increase the improvement obtained with the initial smaller dose, either as regards the number of wet beds or the number of nights on which wet beds occurred.

Test 4.

In Tests 1, 2 and 3 the ephedrine was given in the evening between 5 p.m. and 7 p.m. It was thought that, possibly, in cases who failed to react satisfactorily, the incontinence might have occurred late in the night only. In consequence a second dose given after midnight might be of benefit.

The total of 33 cases gave 181 wet beds before midnight and 266 after midnight during the periods of observation, which were the equivalent of 322 nights for one patient. If the duration of the effect varied with the dose, then the cases receiving gr. 2 (·13 gm.) should show a smaller proportion of wet beds after midnight than should those receiving half this amount. Table II shows that this is not so. In fact, the ratio is greater in the cases receiving the higher dose.

TABLE II.—*Varying Dosage and Time of Enuresis.*

1. Dose	gr. 1 (·065 gm.)	gr. 2 (·13 gm.)
2. Number of cases	26	15
3. Wet beds before midnight	126	44
4. Wet beds after midnight	176	85
(4)/(3)	1·4	1·9
Hours After MN / Before MN	2	2

When a comparison is made on the same patients, first receiving gr. 1 (·065 gm.) and later gr. 2 (·13 gm.), similar results are obtained. Table III shows a comparison on 8 cases extracted from Table II. The cases were given gr. 1 (·065 gm.) for a period equivalent to 1 case over 48 nights and gr. 2 (·13 gm.) equivalent to 1 case over 35 nights. The Table shows that the proportion of wet beds after midnight is higher with the larger dose.

TABLE III.—*Same Cases given first gr.* 1 (·065 *gm.) and later gr.* 2 (·13 *gm.).*

1. Dose	gr. 1 (·065 gm.)	gr. 2 (·13 gm.)
2. Wet beds before midnight	20	12
3. Wet beds after midnight	43	32
(3)/(2)	2·15	2·67

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The greater number of wet beds after midnight in Tables II and III could be due to a disproportion in the hours before and after midnight during which the night staff were on duty. The nurses were on duty for four hours before midnight and eight hours after, the proportion of 1 to 2 resembling the ratio between wet beds before midnight and wet beds after midnight.

Sheets.

In Test 2 a record was kept of the number of sheets wet and sent to the laundry. A definite decrease occurred (Table IV).

TABLE IV.—*Sheets Sent to Laundry.*

	Fortnightly periods.					
Pre-treatment.	1st.	2nd.	3rd.	4th.	5th.	6th.
211	132	81	128	138	133	145

Temperature.

The frequency of micturition is commonly stated to be related to the atmospheric temperature. As an alteration in temperature might have influenced the results of the three tests, the nightly dormitory temperatures at midnight and at 4 a.m. for the cases of Test 2 were averaged, the means for each fortnight being shown in Table V. These means are the means of the mean midnight and 4 a.m. temperatures of each night and averaged for each fortnightly

TABLE V.—*Total Wet Beds for Series of 17 Male Defectives.*

Periods 1–6 = October to February; 1–4 = April to May; A–D = July to August.

	Fortnightly periods of treatment.													
	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	A.	B.	C.	D.
Mean temp.	48·4	46·5	44·5	46·5	46·9	42·1	50	51·3	52·7	57·8	58·4	63·8	61·3	64·
Number of nights wet	79	70	87	106	103+	116+	106	96	95	74	121	115	106	13
Number of times wet	84	82	122	138	128+	142+	145	142	142	118	154	141	144	17

+ = one patient excluded from series as in hospital.

period. The Table shows that when the higher dormitory temperatures occurred not only did no reduction of wet beds take place, but an actual increase was noted. The rise in dormitory temperature did not, therefore, influence the test results favourably.

Mode of Action.

Parkhurst, and Kittredge and Brown, point out that ephedrine contracts the trigone and relaxes the fundus of the bladder. The last two writers add that it activates the internal sphincter, inhibits the detrusor muscle and contracts the ureteral orifices.

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This action would be anticipated to prevent urinary incontinence whether the origin were psychological or physical, and make the causation of the enuresis of little therapeutic interest. Although Kittredge and Brown excluded organic causes before commencing treatment, this was not done in the present series, the actions of the ephedrine being assumed to be on the bladder as described by Kittredge and Brown. If ephedrine acts on the terminal end-organ of micturition, the organs initiating the bladder's action are of no moment from a therapeutic aspect.

Discussion.

Table VI shows the results obtained in the tests according to changes in the number of nights in which incontinence occurred. The final column, "Worse," is of little value, as it is clear that if a patient, before treatment, was incontinent every night, as was the case with most patients, he or she could not become worse.

Table VI.—*Nights in which Incontinence Occurred.*

Test.	Cases.	Sex.	Dose (gr.).	Improved.	Doubtful and no change.	Worse.
1	42	M. & F.	½	20 (47·6%)	21	0
2	17	M.	1½	7 (41·2%)	9	1
3	11	F.	¾–2¼	9 (81·8%)	2	0
	—			—	—	—
	70			36	32	1

Table VII shows the results according to the number of times each case was incontinent. A few of the improvements, as noted in the descriptions of each test, were temporary in character.

Table VII.—*Number of Times of Incontinence.*

Test.	Cases.	Sex.	Dose (gr.).	Improved.	Doubtful and no change.	Worse.
1	42	M. & F.	½	26 (61·9%)	5	11
2	17	M.	1½	8 (47·0%)	4	5
3	11	F.	¾–2¼	11 (100%)	0	0
	—			—	—	—
	70			45	9	16

The tests, especially Test 3, showed that results were better with a dose of gr. ¾ (·049 gm.) than with gr. ½ (·032 gm.), but that a dose exceeding gr. 1 (·06 gm.) gave no further improvement.

The markedly higher percentage of improvement in Test 3 as compared with Tests 1 or 2 cannot be due to all the cases being females, for in Test 1 the percentage of improvements for the number of nights incontinent was 60 for the males and 25 for the females, and for the number of times incontinent 60 and 66 respectively. If the sex affected the results the rates in Table VII should be less for Test 3 than for Test 2, not more. The differences may

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perhaps be due to the differences in the mental grade of the cases. The are shown in Table VIII. In Test 3 the proportion of idiots was lower than i the other tests.

TABLE VIII.—*Mental Grade of Patients.*

Test.	Total.	Idiots.	Imbeciles.	Feeble-minded.
1	42	38 (90·5%)	2	2
2	17	11 (65%)	5	1
3	11	1 (9·1%)	9	1

If the mental grade were the sole factor in the differences in the rates o improvement, then the idiots should show a lower improvement rate than th imbeciles and feeble-minded. This is shown in Table IX.

TABLE IX.—*Improvement of Each Mental Grade.*

	Number.	Improved nights.		Improved times incontinent.	
Idiots	50	17 (34%)		27 (54%)	
Imbeciles	16	10 (62·5%)	70%	13 (81·2%)	&
Feeble-minded	4	4 (100%)		3 (75%)	

These figures, however, include those idiots who were given the small dose of Test 1. If the idiots who received the larger doses in Tests 2 and 3 are com pared with the imbeciles and feeble-minded who received the same dose, it w be seen that idiots reacted less favourably to ephedrine than did higher grad defectives (Table X).

TABLE X.—*Improvement and Mental Grade.*

	Number.	Improved nights.	Improved times.
Idiots	12	5 (41·7%)	7 (58·1%)
Imbeciles and feeble-minded	16	10 (62·5%)	13 (81·2%)

The age of the case treated may be related to the success or failure of the treatment. Table XI shows the age-groups.

TABLE XI.—*Improvement in Age-Groups.*

Ages (years).	Number.	Improved nights.	Improved times.
0–	31	14 (45·2%)	19 (61·3%)
10–	25	10 (40·0%)	14 (56·0%)
20–27	15	10 (66·7%)	11 (73·3%)

It is of interest that, although the numbers are small, the greatest improvement occurred in the oldest group, and that this group contained approximately the same proportion of idiots as the age-group below. The increase in the improvement rate cannot therefore be due to a higher proportion of

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liots (see Table XII), and is presumably connected with the actual chronological age of the cases.

TABLE XII.—*Ages and Classifications.*

ges (years).	Idiots.	Imbeciles.	Feeble-minded.	Total.
0–	29 (90·7%)	1 (3·1%)	2 (6·2%)	32
0–	14 (58·3%)	8 (33·3%)	2 (8·3%)	24
0–27	7 (50·0%)	6 (42·8%)	1 (7·1%)	14
				70

By comparing the condition before treatment with the greatest improvement after the commencement of treatment, the degree of improvement can be obtained, even if this is of a temporary nature only.

TABLE XIII.—*Degree of Improvement. Number of Nights Wet per Week.*

Dose (gr.) :—	½.	¾.	1½.	1½.
	Number of cases.			
	44.	10.	1.	16.
Percentage of improvement. 100%	6	8	1	9
90	0	0	0	0
80	1	0	0	3
70	4	0	0	1
60	0	0	0	0
50	2	0	0	0
40	0	0	0	1
30	3	0	0	0
20	2	0	0	2
10	9	1	0	0
0	17	1	0	0

TABLE XIV.—*Degree of Improvement. Number of Times Wet per Week.*

Dose (gr.) :—	½.	¾.	1½.	1½.
	Number of cases.			
	1.	10.	1.	16.
Percentage of improvement. 100%	0	8	1	9
90	0	0	0	0
80	0	0	0	3
70	0	0	0	1
60–50%	1	0	0	1
40	0	2	0	1
30	0	0	0	0
20	0	0	0	0
10	0	0	0	1

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Tables XIII and XIV show the maximum degree of improvement obtained the immediate pre-treatment fortnight being taken as the standard for comparison.

The known duration of the improvement is partly dependent upon the periods of observation. The maximum improvement did not invariably persist to the end of the observation period, although improvement of a lesser degree may have done so.

TABLE XV.—*Cases in Which Maximum or Total Improvement in Number of Nights Wet, and Times Wet in Brackets, was Present at Termination of Period of Observation.*

	Cases.	Duration of observation (weeks).	Maximum improvement.	Total improvement.
Test 1	27	3	12	21
Test 2	17	12	5 (5)	10 (11)
Test 3	10	16	1 (1)	8 (9)

This table shows that the maximum degree of improvement does not invariably persist for any great length of time, either with regard to the number of nights on which enuresis occurred or to the total number of times wet. On the other hand, improvement of some degree persisted to the end of the period of observation in most patients, in from 59 to 80 per cent. of cases.

TABLE XVI.—*Number of Cases in Whom Improvement (Nights Wet) Occurred in Tests 1, 2, and 3, with Length of Improvement in Weeks. + = Persisting to End of Observation.*

	Weeks.	1.	2.	3.	1+.	2+.	3+.
Test 1.	*Maximum imp.*	13	2	0	7	3	2
	Total imp.	4	2	0	5	6	10

	Weeks.	0–3.	4–6.	7–9.	10–12.	13–16.
Nights wet	*Test 2 max. imp.*	8	3	1	0	—
	Test 3 max. imp.	4	3	2	0	0
	Test 2 total imp.	1	3	3	0	—
	Test 3 total imp.	1	0	0	1	0

TABLE XVII.—*Number of Cases in Whom Complete Durations of Improvements were Recorded.*

	Durations in weeks.	0–3.	4–6.	7–9.	10–12.	13–16.
Times wet	*Test 2 max. imp.*	7	3	1	0	—
	Test 3 max. imp.	5	3	2	0	0
	Test 2 total imp.	3	2	1	0	—
	Test 3 total imp.	0	0	0	0	2

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TABLE XVIII.—*Number of Cases in Which Improvement Persisted to End of Observation, with Duration of Improvement in Weeks.*

	Duration in in weeks.	0–3+.	4–6+.	7–9+.	10–12+.	13–16+.
Nights wet	Test 2 max. imp.	0	1	3	1	—
	Test 3 max. imp.	0	0	1	0	0
	Test 2 total imp.	1	1	4	4	—
	Test 3 total imp.	0	0	0	0	8
Times wet	Test 2 max. imp.	0	1	3	1	—
	Test 3 max. imp.	0	0	1	0	0
	Test 2 total imp.	1	0	4	6	—
	Test 3 total imp.	0	0	0	0	9

These tables show that improvement may not occur until the ephedrine has been given for from 9 to 11 weeks, although such a long delay is unusual. A delay of approximately a month before improvement occurred was common.

Ephedrine was given continuously to the cases of Test 3 for one year. After about 8–9 months of treatment the numbers of cases showing improvement decreased (Table XIX), the numbers of those becoming worse or showing no change increased. It may, therefore, be that ephedrine should be given intermittently, and that too great a length of dosage may reduce the earlier beneficial results.

TABLE XIX.—*Continuous Treatment for One Year.*

A = October to February; B = April to May; C = July to August.

Periods..	Nights wet.			Times wet.		
	A.	B.	C.	A.	B.	C.
Improved	7	9	5	8	10	5
Doubtful	2	4	2	3	2	1
No change	7	3	7	1	0	5
Worse	1	1	3	5	5	6

CONCLUSION.

1. Ephedrine hydrochloride improved nocturnal enuresis in approximately 40–60 per cent. of mental defectives, but made some cases worse.

2. The improvement was of considerable duration in from 66 to 75 per cent. of cases.

3. An oral dose of approximately gr. 1 (·065 gm.) was required nightly for children and adults. Higher doses did not produce greater improvements.

4. A rise in the dormitory temperature did not decrease the total number of wet beds.

5. The number of sheets sent to the laundry decreased.

6. Higher-grade cases reacted more favourably than did lower-grade defectives.

7. Older patients showed a higher improvement-rate than did the younger.

8. With adequate dosage, the degree of improvement in each case was usually from 80 to 100 per cent.

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9. Although improvement persisted to the end of the observation periods (i.e. for 3 and 4 months) in about 75 per cent. of the cases, the maximum improvement persisted for this length of time in only 25 per cent. of the cases.

10. Improvement did not commence until approximately 3 months after the beginning of the treatment in one case. The majority of improvements commenced before the end of one month.

11. The numbers of cases maintaining their improvement when ephedrine was given continuously decreased after 8 or 9 months, so intermittent dosage, as for a month with monthly intervals, may be more advantageous.

In conclusion, my thanks are due not only to Dr. J. F. Lyons, Medical Superintendent of Hortham Colony, for permission to carry out these investigations, but also to Chief Male Nurse H. T. Hills and Sister E. M. Walker, who were responsible for the excellent keeping of the numerous records required.

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FURTHER ASPECTS OF BRIEF RETROGRADE AMNESIA.

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KNOWLEDGE of amnesia is dependent upon the subject's statement. He can tell us what he will. If he has studied the subject well, he can mislead us. He may have motives for fabricating. He may benefit, he thinks, financially, socially or in other material ways, by inventing an amnesia. A history of grave injury may produce avoidance of danger or of unpleasant work. A medical history, which the patient may think unusual, may give him prestige or sympathy. Finally, he may invent an amnesia to give the doctor a good story or to "pull his leg."

COMPARISON OF CASES.

In view of these possibilities of error in the descriptions of R.A., a comparison between two types of cases examined by the same psychiatrist has been made.

The first type of case consisted of candidates for officer-training at a War Office Selection Board, commented upon previously (Rudolf, 1947). These subjects would desire to appear at their best when interviewed by the psychiatrist. Conscious exaggeration of amnesia would be unlikely.

The second type of case consisted of men receiving pensions from the Ministry of Pensions, examined from 1 to 29 years after the injuries or incidents had occurred. As the possibility existed that the reporting of R.A. might be related to the state of the mind before the occurrence of the injury or incident, the cases were divided into three groups:

(*a*) Those in whom thoughts of danger had been present for at least one minute before the incident;

(*b*) those in whom thoughts of danger were unlikely to have been present for more than a few seconds preceding the incident; and

(*c*) those in whom no thought of danger, even for the briefest of periods, could have been in existence prior to the incident or injury.

Group (*a*) consists largely of incidents and injuries occurring during action or air-raids. Group (*b*) consists largely of road accidents, in which the subjects would usually not be thinking of danger, unless "nervous" of transport or of the particular driver. Group (*c*) consists of accidents which took place without even the shortest of warnings. All accidents which the subjects might conceivably have been anticipating were excluded from this group.

Table I shows that the W.O.S.B. and M. of P. subjects gave similar statements in Group (*c*), but widely differing ones in Groups (*a*) and (*b*).

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TABLE I.—*Total Cases and Percentage of Retrograde Amnesia (R.A.) in brackets in W.O.S.B. and M. of P. Cases.*

	W.O.S.B.	M. of P.
Group (*a*)	50 (16·0)	78 (48·7)
,, (*b*)	27 (66·7)	35 (77·2)
,, (*c*)	22 (72·7)	11 (72·7)

The cause of the differences in Groups (*a*) and (*b*) might be related to the occurrence of unconsciousness or post-traumatic amnesia (P.T.A.) (see Table II).

TABLE II.—*Total Cases and Percentage of R.A. in brackets without P.T.A. and with P.T.A. in Groups* (a) *and* (b) *of W.O.S.B. and M. of P. Cases.*

	W.O.S.B.	M. of P.
Group (*a*) :		
No P.T.A. . . .	45 (15·5)	24 (25·0)
P.T.A.	5 (20·0)	54 (59·3)
Group (*b*) :		
No P.T.A. . . .	10 (30·0)	5 (40·0)
P.T.A.	17 (88·2)	30 (83·3)

In Group (*b*) the proportions of R.A. amongst both the W.O.S.B. and M. of P. cases are very similar. As in the M. of P. cases of Group (*a*) the proportion of R.A. amongst the cases with P.T.A. is greater than amongst those without it.

The relative equality of the proportion of R.A. in both the No P.T.A. and P.T.A. classes of the W.O.S.B. series of Group (*a*) is the exception in both Groups (*a*) and (*b*). The low proportion of R.A. in the P.T.A. cases is very striking.

In view of the markedly higher proportion of R.A. in the P.T.A. cases in both the W.O.S.B. (Group *b*) and M. of P. cases (Groups *a* and *b*), it is most probable that both the W.O.S.B. candidates and the M. of P. pensioners did not falsify their experiences.

The table shows that in Group (*a*) W.O.S.B. cases, the presence of R.A. is not related to the presence of P.T.A., approximately equal percentages of cases occurring amongst those without, and those with, P.T.A. In the M. of P. cases the situation is very different. In the cases without P.T.A. the proportion of M. of P. cases with R.A. is slightly greater than in the W.O.S.B. series, but the proportion of R.A. cases amongst those with P.T.A. is three times as great as in the W.O.S.B. cases.

Tables III and IV, dealing with cases of Groups (*a*), (*b*) and (*c*) together, show that R.A. is remarkably similar in cases with P.T.A. amongst both the M. of P. and the W.O.S.B. series. In the cases without P.T.A. or unconsciousness, its presence is more common in the M. of P. cases than in the W.O.S.B. group. As the percentages are similar in Table III, it would again be unlikely that the subjects of Tables III or IV had been deliberately falsifying

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their statements. Table IV must represent a real difference, and shows R.A. is more common amongst non-P.T.A. cases in the M. of P. series than amongst the same cases in the W.O.S.B. group. As judged by the above tables, the assumption can be made that the majority of W.O.S.B. and of M. of P. cases did not falsify their actual beliefs of the presence of R.A., unless, perhaps, some of the W.O.S.B. cases of Group (*a*) with P.T.A. deliberately omitted to report the R.A. The possibility exists that, as these candidates would wish to show themselves at their best, they would have not reported R.A., but if so, there appears to be no reason why the candidates of Groups (*b*) and (*c*) should have reported their R.A. If some candidates believed that their acknowledgment of the presence of R.A. would militate against their selection for officer-training and consequently hid its existence, why should its presence be acknowledged in proportions resembling those of the pensioners in Groups (*b*) and (*c*) ?

TABLE III.—*Cases with P.T.A. (i.e. Unconscious after Injury or Accident).* (*Percentage of Cases with R.A. in brackets.*)

	Total cases.
M. of P.	85 (71·8)
W.O.S.B.	33 (75·8)

TABLE IV.—*Cases not Unconscious after Injury or Incident.* (*Percentage of Cases with R.A. in brackets.*)

	Total cases.
M. of P.	40 (55·0)
W.O.S.B.	66 (27·3)

RETROGRADE AMNESIA WITHOUT P.T.A. OR CONCUSSION.

In a previous article (Rudolf, 1947) attention was drawn to the occurrence of amnesia when accidents are anticipated by the subject but do not, in fact, occur, as in parachute-jumping. Other types of cases are quoted below :

1. Officer buried in dug-out by blockage of exit by earth. Amnesia for 4 hours, still present 26 years later, although subject was not injured in any way whatsoever.

2. Woman, aged 72 years, in shop that caught fire in her presence. Amnesia from time of the entrance of two boys who came to help to extinguish the fire until on couch, after fire extinguished, holding a cup of tea and saucer in a tremulous hand. With the exception of slight singeing of the hair of the head, no injury was sustained.

3. Woman, aged 20 years, in A.T.S. Amnesia for accident occurring 1½ years previously. Recalled seeing bus approaching her and nothing further until she was standing up on the road, leaning forward with blood coming from face. Informed was not unconscious. The sole injury sustained was a cut on the right cheek. Hypno-analysis, conducted over numerous sessions, recalled to her memory riding down a hill on her bicycle, seeing the rear of a lorry in front of her, looking down to ensure that shoes she was carrying were not slipping out of her hand on the handle-bar, looking up and seeing that lorry was much nearer, realizing inability to pull up, swerving around outer side of lorry, seeing bonnet of approaching bus in front of her, realizing there was sufficient space for her to pass between bus and lorry, but feeling body paralysed and mind unable to compel it to act appropriately. She recalled the mirror projecting from the lorry, the windows of the bus flashing

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past her, seeing front wheel of her bicycle striking the bus, being thrown up from the seat of the bicycle with her left arm beside her face, head striking something that gave way, sound of glass breaking and sensation of falling through the air to the ground.

4. Woman aged 71 years. Amnesia for falling downstairs 5 years previously. Was able to recall commencement of turning over at the top of the stairs and then sitting at the bottom, and noticing that a picture on the wall, half-way down the stairs, was hanging crooked. Under hypno-analysis, conducted over 15 sessions of approximately 30 minutes each, recalled falling in space, sound resembling that of turning on an electric light by means of a chain, passing picture hanging straight on the wall, palmar surface of fingers of right hand striking picture, falling head first with face uppermost, fearing might crash into the hall-stand, knocking toes of one foot, hearing a thud, sliding down the lowest two or three stairs with her head towards banisters and feet towards wall, knocking right elbow on, probably, the bottom stair, bending trunk, striking back of head and left buttock simultaneously, and being in sitting position with back against pillar of the lowest banister. The fall was caused by the subject taking a step sideways over the edge of the top stair in the dark of the black-out. An electric lamp, with a chain attached, hung over the landing at the head of the stairs. She believed, although not absolutely certain, that, as she began to fall, her left hand pulled the chain. As the subject saw the picture on the wall as she passed it, some illumination must have been present.

If, in either case 3 or 4, the head had been struck more violently and concussion had occurred, the amnesia would have been termed retrograde. The fact that concussion did not take place was only incidental, the amnesia being present even without the occurrence of so-called P.T.A.

The Abolition of R.A.

Nathan (Russell and Nathan, 1946) administered barbiturate narcosis to 40 patients recovering from head injury. The method consisted of giving one injection to each man, accompanied by the customary questioning and "during the following week or months he would be questioned again from time to time." With this method, "some additional memory in the R.A. period was recovered in 12 cases, although this was sometimes insignificant."

My own experience confirms Nathan's findings of poor results. To recover the memory completely, hypnosis is necessary on many occasions. Simple questioning after one period is quite insufficient. I find that at least six sessions of hypnosis, each of approximately 30 minutes in duration, are required to recall all the memories, including those of the most alarming moments. Often a total of 5 or 10 hours of hypnosis is needed. A total of a few hours may recall a few memories or even nothing.

However, occasionally the R.A. can be reduced with the type of short therapy used by Nathan, who reports one case in which the R.A. was reduced from 30 minutes to *nil*, and three others in which it was reduced to a moment from 2 hours, 20 minutes and a few seconds respectively. In these cases the hypnosis was performed, at the latest, two months after the injury.

Guttmann (1946) has recorded that R.A. may shrink for months after an injury, and Russell and Nathan (1946) report two cases of this occurrence. The first case showed an R.A. of 7 years' duration, one week after the accident, but 9 weeks later this had reduced itself to a few minutes. In the second case, an R.A. of 6 months in duration, present 3½ months after an injury, had

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shortened to a few minutes one month later. A third instance, my own, consisted of the gradual disappearance of an amnesia preceding the explosion of a bomb 7 yards distant. Two weeks after the incident a full and complete memory had returned without treatment. No injury of any kind occurred. In view of these natural reductions or disappearance of the R.A. during the months following an incident, the results of therapy cannot be assuredly due to the treatment if it is given before the expiration of a year from the event.

The natural disappearance of R.A. can be readily studied in patients immediately after receiving electric-convulsive therapy. As the patient gradually and progressively recalls more and more of the period immediately preceding the passage of the current, the bewilderment passes, the expression becomes more full of meaning and, finally, all is recalled, including the placing of the electrodes upon the head. No abreaction or evidence of fear is observed during this recall of the memory. The memory returns calmly. This calm return of the memory, without any emotional sensation, was experienced by myself during the fortnight succeeding the explosion of the near-by bomb.

The conditions are very different during the recall of a terrifying experience. As the memory is recalled, no signs of fear appear until the approach of the moment of expectation of greatest danger. Then alarm may be marked. Flushing, palpitation, tremor and agonized facies may all be seen. Sweat may break out on the brow, and cries of fear, and terror-stricken shouting may be heard. Violence and fighting have been recorded.

The Causation of R.A.

As pointed out by Russell and Nathan (1946), R.A. can be organic in origin. These authors refer to its occurrence after electric-convulsion therapy, status epilepticus, meningitis, acute cerebral anoxia, as in hanging, CO poisoning and severe loss of blood. It occurs in air-crew after a tight turn when body tissues increase in weight (Matthews, 1945), and Donald (1947) reports its occurrence for the post-convulsive automatism, covering periods up to 7 hours in duration, observed in experimental oxygen poisoning.

Although many cases of R.A. are organic in nature, many others are of psychological origin. Russell and Nathan (1946) point out that one "type of case bears a remarkable resemblance to the behaviour of a repressed complex in that an experience which had been registered and retained was not recalled except through an association of ideas, and this experience caused an emotional response which was appropriate to the forgotten material."

Not only does this type of case bear a resemblance to a repressed complex, but, in my experience, it is an instance of repression, this being due to intense fear, accompanied, possibly, by strong feelings of guilt.

The failure to obtain any recall of memory in 34 cases and of complete recall in 6 cases made Russell and Nathan (1946) report that their investigations with barbiturate hypnosis "provide confirmation of the view that both the R.A. and the P.T.A. in most cases is the result of physical effect of injury on brain neurones."

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If the neurones are injured, how can they recover to produce a detailed account of the previously forgotten incidents from a few days to many months after the incident? The coincidence would be remarkable if oedema or other temporary impairment of neurone function should disappear from causes other than psychological during psychological treatment, even without the aid of barbiturates or other drugs, as much as 30 years after the amnesia-producing incident.

Guttmann (1946) points out that failure to remove the amnesia does not prove the organic nature of the condition, adding that real experiences or inhibitions may be concealed, even under sodium amytal.

Sargant and Slater (1941) suggest that the very brief period of amnesia which consists of the period immediately before a blow on the head, and which sometimes cannot be recalled under hypnosis, is due to organic causes. If so, it may be similar to that occurring during a tight turn in the air and other physical and chemical disturbances. However, it is very possible that the failure, which occurs in the exceptional case only, to recall the actual blow and the immediately preceding fraction of a second, may be due to imperfect technique. In the majority of cases, providing sufficient time is spent on each case, the complete period, including the blow, can be fully recalled.

Russell and Nathan (1946) describe cases showing that the retention of recent memories is less firmly established than is that of earlier ones. Although, in most cases, the last event recalled under hypnosis has been the blow causing unconsciousness, I have seen one instance (Rudolf, 1947, case 24) in which the last event recalled under hypnosis was not the last event in order of time before unconsciousness occurred. In another instance (Rudolf, 1947, case 25), an untreated patient, the amnesic period covered a brief period before he struck the ground. The memory of the last event, striking the ground, was not repressed or destroyed.

Without treatment the amnesic gap appears to be shortened from the more remote period. Under hypnotic treatment of many sessions the gap can be closed from either end, but the moment of greatest terror, which is usually at the more recent end, is the last event to be recovered. During the recovery of any memory not associated with fear, no abreaction is seen. The items are merely quietly remembered. The organically-produced amnesia causes no abreaction as it disappears, but that psychologically produced shows abreaction as the moments of fear are approached and reached. In many cases the organic amnesia fades, leaving the psychological amnesia, which cannot be abolished unless prolonged treatment is performed. This difference in the emotion associated with recall is the significant, and perhaps the sole, difference between the two causally-dissimilar amnesias.

Symptoms

In 104 M. of P. cases examined from $1\frac{1}{2}$ to 29 years after injuries or terrifying incidents, a total of 38 different symptoms were described. The number of cases, either with or without R.A., who reported symptoms are

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shown in Table V, symptoms reported by less than 6 patients being omitted. This table shows that depression, irritability, sweating and poor memory were described less frequently amongst the cases without R.A. than amongst those with it. Tremor, nightmares, insomnia and giddiness, were more common amongst cases without R.A. than amongst those with it. Consequently, cases with R.A. tend to complain of depression, irritability, sweating and poor memory. Cases without R.A. tend to report nightmares, insomnia and giddiness, and to show tremor.

TABLE V.—104 *Cases Reporting Symptoms.* (*Percentages in Brackets.*)

Symptoms.	With R.A. (63).	Without R.A. (41).
Depression	14 (22·2)	5 (12·2)
Poor memory	10 (15·9)	4 (9·8)
Irritability	7 (11·1)	3 (7·3)
Sweating	6 (9·5)	3 (7·3)
Nightmares	15 (23·8)	14 (34·1)
Giddiness	12 (19·0)	11 (26·8)
Tremor	10 (15·9)	8 (19·6)
Insomnia	8 (12·7)	10 (24·4)
Headache	43 (68·2)	25 (61·0)
Pains elsewhere	8 (12·7)	5 (12·2)
Poor concentration	6 (9·5)	4 (9·8)

Although a higher proportion of cases with symptoms record R.A. than do those without important symptoms (Table VI), Yule's co-efficient of correlation for symptoms and R.A. is only + ·369.

TABLE VI.—*Symptoms Causing Interference with Normal Activity and R.A.*

	Number.	R.A.
Cases with symptoms (M. of P.)	125	61·2%
Cases without symptoms (W.O.S.B.)	99	42·6%

If the W.O.S.B. candidates who had undergone terrifying incidents and who were in Medical Category A1, that is, those individuals who were regarded as being completely physically fit, are divided into two groups, Table VII is obtained.

TABLE VII.—*W.O.S.B. Candidates. Minor Symptoms Insufficient to Warrant Med. Cat. below A1.*

	Number.	R.A.
Cases with minor symptoms	31	11 (37·0)
Cases without minor symptoms	41	16 (39·0)

The cases with symptoms are those who recorded presence of symptoms in reply to a question on the Questionnaire asking for an account of minor ailments. The table shows that the percentage of cases with R.A. is similar

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in the cases with, and in those without, symptoms. The symptoms were, of course, not sufficiently serious to interfere with full activity.

Although patients may present symptoms for a considerable time, such as the two who had each complained for 29 years, occasional individuals show a slight and gradual improvement without treatment. Examples are of a man who showed R.A. with reference to falling to a lower deck three years ago. Headaches and nightmares occurred for one year, but during the past two years, the nightmares have been absent. A second instance is the case of a man who sustained concussion with R.A. when diving two years ago. Although the head pain and slow cerebration persist, the memory for day-to-day events is now improving. A third patient, four years ago, met with a road accident, causing concussion and accompanied by R.A. Giddiness still occurs, but headaches ceased one year after the injury. In view of the fact that anosmia following concussion may disappear many months, or even a year, after the damage, the cessation of the headaches might have been due to organic improvement.

Although the symptoms to which reference is made here are assumed to be caused by the injuries or incidents, this assumption is not necessarily correct. Guttmann (1946), in dealing with the late effects of closed head injuries, found that the incidence of one symptom, namely headache, is no greater amongst men who have received head injuries than amongst those who have not. This author obtained his results from an Officers' Board of the N.F.S., so that his figures are comparable with the W.O.S.B. cases rather than with those of the M. of P. group. The figures of Table VII are in agreement with Guttmann's findings, headache and pain elsewhere being in approximately similar proportions in the cases with R.A. and in those without this condition.

Summary.

1. Cases who were likely to wish to appear at their best (i.e. W.O.S.B. candidates) and cases in whom similar motivation was probably not present (i.e. pensioners) reported similar proportions of R.A. for incidents occurring when they were probably not thinking of danger, whether or not unconsciousness had occurred after injury or terrifying incidents.

2. The two series of cases gave different proportions of R.A. for incidents occurring when they were likely to be thinking of danger, i.e. when danger had existed for at least one minute before the incident, the difference being greatest amongst the cases recording P.T.A.

3. When all cases were considered, the percentages of R.A. were similar in the two series when P.T.A. had occurred, but dissimilar when it had not taken place, the M. of P. cases recording 55 per cent. of R.A. but the W.O.S.B. series recording only 27·3 per cent.

4. Attention is drawn to the occurrence of amnesia with anticipated, but not actual, accident, and to R.A. preceding accidents without P.T.A. or concussion.

5. The complete abolition of R.A. by hypnosis requires from 3 to 10 hours. As the R.A. often shrinks over a period of months without treatment, any

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reduction of its length under one year from the precipitating incident may be due to the natural shrinkage rather than to the treatment.

6. The difference between R.A. due to structural, organic causes and that due to psychopathological causes appears to be that the first decreases and may disappear without the occurrence of abreaction, whereas abreaction occurs when the second is decreased or abolished.

7. Under hypnosis, any memory, whether distant or recent, can be recalled first, but the most terrifying memory, even if the most recent, is recalled last.

8. Cases with symptoms insufficient to affect appreciably the health do not record a preceding R.A. in greater numbers than do those without such symptoms.

9. Cases with symptoms affecting the subjects so greatly that pensions have been granted record an R.A. in greater proportions than do W.O.S.B. candidates without such symptoms.

10. Depression, irritability, sweating and poor memory were more common amongst cases with R.A. than amongst those without it. Nightmares, insomnia, giddiness and tremor were more common in cases without R.A. than amongst those recording this condition.

11. Although uncommon, a slow decrease of symptoms may occur as the years pass.

My thanks are due to Dr. E. Casson for permission to quote cases from Mount Pleasant Nursing Home, Clevedon.

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SOME CLINICAL OBSERVATIONS ON THE PSYCHODYNAMIC RELATIONSHIP BETWEEN DEPRESSION AND OBSESSIVE-COMPULSIVE SYMPTOMS.*

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OBSESSIONAL symptoms and depression often co-exist. There are obsessional neurotics who are subject to recurrent depressions, and there are patients with marked obsessional personality features, but not suffering from an obsessional neurosis, who develop severe obsessional symptoms in the course of their depressions only. I do not agree with those writers who maintain that the typical features of the obsessional character can be found in every case of manic-depressive illness.

The study of the interaction between obsessional and depressive symptoms gives rise to a number of problems. The following two questions are of particular importance to the psychiatrist interested in psychodynamics: What is the fate of the obsessive-compulsive symptoms in the course of the depression? And secondly, does depression occurring on the background of obsessional neurosis differ from the typical depressive state? The most striking feature in many of those cases is the exacerbation of the habitual obsessive-compulsive symptoms during the depression and the emergence of new ones, usually with overt obsessive-destructive contents. The impulses are, during the course of the depression, much less subjected to secondary elaborations, such as over-compensation, displacement, symbolization and sublimation, than is the case in the typical obsessional neurosis. Those mechanisms tend to break down in the course of the depressions, and compulsions directed against external objects and the self appear undisguised and sometimes come precariously near to real action. The newly emerging obsessions are, as a rule, centred around the same complexes as are the habitual symptoms; e.g. a patient who had for many years been suffering from the compulsion to inspect the gas and water taps several times every evening lest his family may be drowned and gassed had periods of depression lasting for six months, during which the fear of having to murder his wife and child was the most prominent symptom. That compulsion had emerged only after the depression had been present for a week. It subsided completely with the depression. This is the type of case that is often diagnosed as recurrent or cyclical obsessional neurosis. In those cases the habitual obsessional symptoms which had been present for a long time prior to the depression are not always easy to ascertain during the depression, which is overshadowed by the much more spectacular recent obsessions.

* Read as a contribution to the symposium on "Psychodynamics of Depression" at the International Conference of Physicians in London on 10 September, 1947.

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There is another feature which colours the depressive symptoms of the obsessional. It is the well-known tendency to doubt which makes the patient take up a critical attitude towards his ideas and even to his pathological mood. While the typical obsessional neurotic is preoccupied with the fear of doing wrong and with precautions against such impulses, and while the typical depressive patient is convinced that he has sinned, the obsessional going through a period of depression tortures himself with the fear that he may have done wrong in the past. The self-accusations often take the form of phobias projected into the past. They show a tendency to spread like obsessional ideas, and the patient would take obsessional precautions against them. An obsessional woman who, in her depressions, tortured herself with the fear that she might have done harm to a child many years ago, and accused herself of acts which she knew she had never committed, had worked out a ritual of avoiding children, with the professed purpose of not giving food to those self-accusations. Her attitude towards them was similar to that of the obsessional neurotic to his obsessions. In many of those cases the depressive mood does not dominate the clinical picture. Some psychiatrists are inclined to regard the depression in those cases as a natural reaction to an exacerbation of the obsessional illness. A variety of clinical facts which I pointed out some time ago (1) argue against such an explanation.

In studying those cases it becomes obvious that the obsessional personality structure has a modifying effect on the mechanisms of pathological depression. It tends to counteract regression to the deepest sadistic level, and to prevent a complete break with reality. Part of the aggressive impulses, which in the typical depression are mainly directed against the self, are diverted against external objects. Those impulses are subjected to the brake of obsessional ambivalence. Thus the obsessional personality structure exerts an integrating and preserving influence in a situation charged with enormous tension. We recognize the stabilizing effect of the obsessional personality structure which Glover (2) aptly called its buffer function. That effect can be demonstrated even more clearly in the interaction between obsessional and schizophrenic manifestations. Here we can study in action one of the " modifiers " postulated by Professor Kallmann (3) from the genetic point of view. Whether, in an individual case, such a modifying influence makes itself noticeable clinically must depend on quantitative factors.

If we take into consideration the two mechanisms which I have tried to demonstrate, namely the aggravating and unmasking effect of depression on overt and latent obsessional symptoms and the integrating influence of the obsessional personality structure on the depression, we shall, I think, arrive at a better understanding of some atypical clinical conditions often classed among borderline states. The majority of cases of so-called cyclical obsessional neurosis may become clearer and their spontaneous recoveries may appear less unexpected if we search closely for symptoms of depression and for a history of obsessional features.

The kind of interaction which I have just described is not the only one, but it is the most common. There are other forms of modification of depression by the obsessional neurosis and personality structure which I can only mention

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briefly. There is one in which the habitual obsessions fade into the background during the course of the depression, which is characterized by marked aggressive behaviour, and another in which the depression becomes a masochistic orgy. In both those cases the symptoms are coloured by doubts.

In the few minutes at my disposal I could not give more than a rough sketch of some clinical observations which demonstrate the importance of the psychodynamic approach for symptomatology and diagnosis. These important aspects of clinical psychiatry will have to be cultivated again, if only to enable us to compare notes and to understand each other's language. It often seems that in our zeal for explaining and treating mental illness we are in danger of losing sight of what we are trying to explain and to cure.

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LUNG ABSCESS FOLLOWING ELECTRO-CONVULSIVE THERAPY: DESCRIPTION OF A CASE.

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FROM the available literature it appears that inhalational abscess of the lung following E.C.T. is a rare condition, but it is difficult to assess the actual incidence. Cook (1944), in his extensive review of the subject, quotes Meduna and Friedmann (1939) as stating that lung abscess occurred in 0·1 per cent. of cases, but this probably refers to patients undergoing metrazol convulsions, in whom there is an additional risk of embolic abscesses due to mobilization of thrombus at the site of injection. Jessner and Ryan (1943) mention that aspiration pneumonia may complicate metrazol treatment, and that pulmonary abscess may occur as a result of old pelvic thrombo-phlebitis or from mobilization of thrombus at the site of injection. They do not refer to inhalational lung abscess complicating E.C.T. Sargant and Slater (1944) state that chest complications are rare after convulsion treatment. Kraines (1943) and Brain and Strauss (1945) do not discuss the condition. Vassallo (1946) in an unpublished series of over 300 cases has observed one inhalational lung abscess. Kalinowsky and Hoch (1946) say: "The development of pulmonary diseases during treatment is rare in E.C.T., but was quite frequent in metrazol therapy." They mention some possible reasons for this, e.g. abscess due to mobilization of thrombi at the site of injection. They add: "The literature on E.C.T. contains only one case of pulmonary abscess" (Kalinowsky and Werthing, 1943). The paper quoted, however, merely states, that the patient developed a lung abscess which was successfully treated with sulphanilamide. All authorities agree that pre-existing lung disease, and especially tuberculosis, is a strong contra-indication for E.C.T. Since there are so few references to this illness in the literature it seems profitable to describe a case.

Case history.—Maltese, male, driver R.A.S.C., aged 32 years.

Admitted to a General Hospital in Malta on 8 February, 1946, as a transfer from a hospital in the Middle East, where a diagnosis of psychopathic personality had been made. Previously, in May, 1944, and January, 1945, there had been two brief psychotic episodes in which he had been violent, aggressive and hallucinated.

Apart from a history of fits in childhood there was nothing of note in the previous history. His father and a paternal uncle were also reputed to have had fits.

He joined the Army in 1940; there was no evidence that he had undergone battle stress.

Before admission he refused food for three days and required rectal feeding.

On admission he refused to speak, would not feed himself and was completely indifferent to his surroundings. A provisional diagnosis of catatonic schizophrenia

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was made and it was decided to treat him by E.C.T. Physical examination was negative except for his mouth, which was foul. Captain E. M. Davison, A.D.C., diagnosed Vincent's infection; the teeth were sound. Treatment with potassium bichromate and hydrogen peroxide was instituted; there was rapid improvement. On 12 February, 1946, a chest X-ray was negative. On 16 February his mouth was clear and on the following day the first convulsion was given, using a McPhail-Strauss Universal Electroplexy apparatus: subsequently, four more were given on 19, 24, 26 February and 5 March. None of these was particularly violent or in any way abnormal; the voltage used was 80 with a current of 100 milliamps. lasting ·35 of a second. The duration of the fits was never more than 40 seconds. From the beginning of treatment he showed a marked change for the better; he was approachable, co-operative, fed himself and was up and about in the ward.

On 8 March, 1946, he first complained of cough, associated with purulent sputum, which was not foul smelling, and pain in the front of the chest; the evening temperature was 101° F., but there was no rigor. These symptoms persisted and fever continued for 5 days, varying from 100° F. to 102° F., and then fell by lysis. On 13 March the temperature was 99° F., and apart from scattered rhonchi there was nothing obvious on physical examination. A provisional diagnosis of virus pneumonia was made. A chest X-ray on 14 March showed infiltration of the whole of the left upper and mid zones, and a large thin-walled cavity with a fluid level in the left infra-clavicular region. The radiologist thought that this picture suggested pulmonary tuberculosis, but in view of the history and the recent negative X-ray lung abscess seemed more probable. Facilities for bronchoscopy were not available. Six sputum examinations were made; they were purulent, but contained no blood, and no tubercle bacilli were found; the organisms were staphylococci, streptococci and pneumococci, with none predominating. All were penicillin-sensitive. The leucocyte count was 19,500 per c.mm. (polymorphs 90 per cent.). On 22 March postural drainage and penicillin treatment (25,000 units 3-hourly) was begun. There was a gradual but definite improvement in his condition; the postural drainage was very successful and the temperature remained normal. Despite knowledge of the site of the abscess there were never any physical signs. An X-ray on 6 April showed that the cavity was much smaller and that the surrounding consolidation was resolving. X-ray of the sinuses was negative. He remained afebrile and by 15 April his general condition was good, and, since he was producing no more sputum, postural drainage was stopped and he was allowed up. The chest was re-X-rayed on 16 April and there was further improvement. Although his dental hygiene remained poor there was no specific lesion. On 27 April his general condition was good, his weight was increasing, his appetite was improved and he had no cough, but an X-ray showed some deterioration—the cavity was multilocular, and there was a fresh area of consolidation medial to it. The leucocyte count was 17,900 per c.mm. He remained ambulant, mobile and symptomless, and from a further X-ray on 5 May it was clear that there was considerable improvement and that the consolidation had disappeared. The leucocyte count was 8,000 per cu. mm., with a normal differential picture, and the penicillin, which had been given all this time, was stopped—the total was 8,255,000 units.

He was still passive and unresponsive and took little or no interest in his surroundings; for hours on end he sat or stood in one position, but if encouraged would walk about and carry on a desultory conversation. Shortly afterwards he was transferred to the Civilian Mental Hospital, when his physical condition was good and his mental condition showed no further improvement.

Discussion.

This case demonstrates one of the little-emphasized dangers of E.C.T., and illustrates some of the difficulties which can arise. In the available but representative literature at our disposal, only Cook (1944) stresses the need for thorough preliminary dental examination, and the potential dangers of oral infection or other dental disease. This patient was known to have a gum infection and full precautions were taken, but even so he developed a lung

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abscess, which was presumed, despite its site, to be inhalational, because there was no evidence of any nidus from which an embolus could have arisen.

All authorities agree about the danger of lighting up a latent tuberculous infection by E.C.T., but the possibility that this patient's lesion was tuberculous was excluded by the negative chest X-ray before treatment began, by the absence of tubercle bacilli in the sputum, and by the response to treatment. The first X-ray following E.C.T. strongly suggested tuberculous infiltration with cavitation, and, but for the fact that a previous plate had been taken, treatment might have been dangerously delayed—the more so because of the slight degree of systemic upset. The leucocyte count was a valuable guide.

This complication affects the prognosis in a peculiar way. Owing to the necessary abandonment of the sequence of E.C.T. the patient did not maintain his initial improvement, and his mental condition worsened gradually. Because of his reduced activity, apathy and immobility the recovery of his lung condition may be transitory and the final prognosis doubtful. It is unhappily clear that a vicious circle has been established, and it is difficult to see how this can be broken except by a spontaneous remission, since neither E.C.T. nor insulin therapy can now be given.

Because of the inherent dangers it has long been recognized by psychiatrists that a chest X-ray is required before treatment is begun, but of five well-known authorities only Cook (1944) emphasizes that a full dental examination is essential. These precautions will have to be observed with even greater care, since E.C.T. is becoming a feature of out-patient psychiatry.

In dealing with patients who have had E.C.T., the physician must not ignore what may appear to be minor complaints, since a serious organic lesion may be present in an unco-operative or apathetic individual, with few physical signs and little systemic disturbance. There is always the temptation to ascribe minor aches and pains to the effects of treatment or mild intercurrent infection, but, when there is any doubt, a second chest X-ray is always justified.

Summary.

A case is described in which an inhalational, non-putrid lung abscess developed in a patient with schizophrenia treated by E.C.T. Some suggestions are made about precautions which should be taken both to prevent and diagnose this complication.

Addendum.

On 4 September, 1946, after this paper was completed, we saw the patient again at the Hospital for Mental Diseases, Malta. His physical and mental condition had deteriorated. There was a low grade fever, B.S.R. was 37 mm. in one hour, leucocyte count was 14,000 per c.mm., and chest X-ray suggested a recurrence of the abscess. He was completely withdrawn and negativistic. His general nutrition, which was good, was being maintained by tube feeding.

We wish to thank Colonel W. D. Anderton, M.C., D.D.M.S., Malta Command, and Colonel F. Holmes, O.B.E., Officer Commanding, 90 Military Hospital,

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for permission to publish this case ; also Professor V. Vassallo, O.B.E., Director of the Hospital for Mental Diseases, Malta, for allowing us to see the patient while under his care, and for the kindly interest he has shown.

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Part II.—Reviews.

Chemistry of Muscular Contraction. By A. SZENT-GYORGYI. New York: Academic Press Inc., 1947. Price 25s.

This book, amplifying the Cameron Prize Lecture of 1946, describes the modern conception of muscular contraction and shows the steps by which these advances were made. It is a stimulating account written by one who has contributed much in this field.

It is a fascinating story. Two of the proteins of muscle, myosin and actin, have been shown to be capable of existing in two forms—either fibrous and extended or globular and coiled. They readily form a compound, actomyosin, in which the two types of molecules are each in the extended form and are combined side by side so as to make a double fibre. In certain ionic and enzymatic conditions the extended fibrous molecules shrink to the globular and coiled form, but the myosin on one side of the fibre shrinks more than the actin on the other side, so that the whole long fibre coils up like a spring. The principle is similar to that of the "bimetal" strip except that the changes are chemical instead of thermal.

Such a contraction needs energy. It is now known that the extended "relaxed" actomyosin molecule contains the necessary free energy for contraction in its molecular bonds, the free energy available ($-\Delta F$) being about 7,000 calories. This energy is immediately available, and needs only a suitable change in the ionic conditions for its release. Relaxation, i.e. the return from the coiled to the extended form, cannot occur unless fresh energy is supplied. For some time it has been known that this is obtained by the dephosphorylation of adenosine triphosphate (ATP), and it has also been known that myosin is itself an enzyme for this reaction, but the full method has been found to be unusually simple and automatic: myosin catalyses the dephosphorylation of ATP, thus obtaining by direct contact the energy of the energy-rich phosphate bond, but it has this property when it is in the contracted coiled form only! The result is a simple and stable dynamic system: when in the coiled form, myosin dephosphorylates ATP and obtains the energy required for extension, but when extended it has no action on the ATP. In this way a constant waste of energy is avoided, while energy is immediately available when required.

The story, in addition, has many interesting suggestions that these processes are not entirely unrelated to the processes of neuronic action. (These fundamental biochemical processes in tissues are often related because it is quicker, in evolution, to improve or modify an existing process than to wait for a chance mutation evoking something quite new.) Be that as it may, the reader cannot help noting in this account the repeated references to matters well known to be of importance in the biochemistry of the neuron. Thus, myosin and actin are both highly sensitive to potassium, and form with this element compounds containing it in large quantity, their own properties being markedly altered by the combination. These effects of potassium are often markedly opposed by calcium. When myosin and actin combine, potassium is released in large quantities into the surrounding fluid, and this increase in concentration of ionic potassium in the fluid promptly affects in its turn the properties of the actomyosin just formed. So the process tends to be autocatalytic, only a small disturbance being required to initiate the whole process. "These details may have physiological importance, and suggest that ionic balances

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cannot be looked upon as static environmental factors permanently conditioning certain kinetics. Their slight changes might have trigger actions, or might be the safety buttons which block the trigger."

A stimulating book which can be recommended. W. R. ASHBY.

Clinical Studies in Psychopathology. By HENRY V. DICKS, M.D., F.R.C.P. London: Edward Arnold & Co., 1947. Second edition. Pp. 238. Price 15*s*.

Dr. Dicks' broad approach to psychological problems is well illustrated in this excellent book, now in its second edition. There are chapters on anxiety and obsessional states, hysteria, sexual perversions and abnormalities and drug addictions. There are only minor alterations in the new edition, except in the last chapter.

If Dr. Dicks is broad-minded and tolerant towards the diverse views of the various psycho-pathological schools, the same cannot be said for his attitude towards those who approach these problems from the physical and constitutional side. These are accused of trying to reduce "desire, zest, truth, love, knowledge and values" to Pavlov's reflexes. Slater, in particular, is criticized because of the importance he assigns to organic damage and the primacy of constitution, "and moreover constitution regarded as an unalterable, structural, static matrix, on which events act mechanically as 'conditioning' forces, *a la* Pavlov." Again, he complains that Slater slurs over a great mass of psychoanalytical experience with these few words: "Psychological and physiological conditioning produced by the environmental circumstances of the past."

The reviewer finds it very hard to believe that Slater could have described a living and growing organism as passive and unalterable. If, however, it is allowed that behaviour is the inevitable result of environmental and constitutional forces, surely there is room for all the mechanisms of Freud, the psychotherapeutic activities of Dr. Dicks and the physiotherapy of Dr. Slater.

Dr. Slater is also condemned for trying to explain the music of a violin by the effect of the horse-hair scraping on a cat's entrails, and there are several variations on this metaphor. However, if a wireless set transmits an inadequate performance of Bach's Chaconne, the first reaction is that the soloist is constitutionally incapable of rendering Bach, and that is usually the correct answer. Of course other factors should be excluded, such as the violin itself, the acoustics of the hall, the transmitting and receiving sets, and the experience of the listener should be checked against that of experts. Finally it is possible that the executant had been badly trained. If such were the case an intensive course of re-conditioning by a Doctor of Music might be worth considering. One things seems impossible to get to grips with or explain and that is the aesthetic experience itself. STANLEY M. COLEMAN.

Old Age: Its Compensations and Rewards. By A. L. VISCHAR, M.D. London: George Allen & Unwin, Ltd., 1947. Pp. 200. Price not stated.

Having spent over twenty years in charge of "The Old People's Home" at Basle, the author is entitled to speak with authority on this subject. Dr. Vischar's book makes delightful as well as interesting reading, and there is a wealth of quotation, both scientific and literary. The book will probably leave the reader with the feeling that though much thought and research has been undertaken by many workers, our knowledge of the problems of old age are extremely meagre. We do not know the cause of ageing, though there have been interesting theories by Metschnikoff, Carrel, Bustai and others. We cannot clearly differentiate between normal senescence and pathological processes. We do not know what factors are responsible for longevity, and there

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has been little success with experiments in rejuvenation and the prolongation of life.

Though the words of the Preacher are quoted, as also the pessimistic description by Grukle, it appears that the author holds a more optimistic outlook, and he quotes as well as says much of an opposite opinion. Regarding the achievements of old age, the author is interested in Brinchmann's examination of the creative works of aged artists. Brinchmann found that with age the artist passes from a dynamic phase in middle life to one of increasing introversion. The book contains a number of plates to illustrate this theory.

STANLEY M. COLEMAN.

Foundations of Dreams Interpretation. By SAMUEL LOWY, M.D. London: Kegan Paul, Trench, Trübner & Co., Ltd., 1946. Reprinted. Pp. xiv + 260. Price not stated.

The author, a pupil of Stekel, employs the active and intuitive method of dream interpretation. His approach to the subject is a psycho-biological one, and it is held as a fundamental that the dream is a representation of the whole ego, as a psycho-somatic unit. He believes that the conceptions of Freud, Adler, Jung and Stekel are by no means in true contrast to each other; rather they are complimentary.

It is the thesis of this book that the importance of somatic stimuli in dream formation has been neglected in favour of psychic causation. It is held that there is a need for a unified conception of the total dreaming process, which would consider the two kinds of dream stimuli as having a common denominanator. The manifest dream as a conceptionalized and verbalized event arises at the subconscious level. Below this are the deep dream processes, the real source of the manifest dream. These are non-conceptional, affect-energetic events, arising at a level where psyche meets soma. It is believed that the normal functioning organ bombards the brain with stimuli, interpreted by the psyche as affect, and that this is the normal contribution of the organ to the dream formation. The overstimulated organ, physiologically or pathologically, produces an overdose of affect and the simultaneous stirring up of associated complexes. Dream formations are cited as being determined by peristalsis of the overloaded stomach, bronchitis impeding the breath, toothache, fever, the urinary urge, erection and pollution, etc. These vegetative sources are just as important as psychical stimuli to the dream formation.

Unlike the Freudians, dream gaps, dream distortion and dream symbolism are held to be due to the inability to conceptionalize or verbalize many of the deep-dream processes, which are either unthinkable or can only be represented symbolically.

It has to be said that the author's style does not make for easy reading. Again, while there is much repetition, conclusions and opinions are not clearly summarized. It is, however, an important contribution to the study of dreams in particular, and to the theory of the unconscious in general.

STANLEY M. COLEMAN.

Psychiatric Research. Harvard University Press (London: Geoffrey Cumberlege), 1947. Pp. 113. Price 11s. 6*d*.

This is No. 9 of the Harvard University Monographs in Medicine and Public Health, and consists of papers read at the Dedication of the Laboratory for Biochemical Research, McLean Hospital, Waverley, Mass.

The six chapters are devoted to research at the McLean Hospital, biochemical problems related to psychiatry, the integration of medical and psychiatric problems, protocol for a review of psychiatry, psychical seizures, and the psychobiology of psychiatric research.

The best chapter in the book deals with the biochemical problems related to psychiatry, by Jordi Folch. He draws attention to a number of facts

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which are not well enough recognized—that the brain uses one-fourth of all the oxygen consumed by the body under basal conditions; the metabolism of the brain is highly specialized—for instance it does not require insulin to use glucose—and the pituitary diabetogenic hormone plays no part in its carbohydrate metabolism. The brain lipids are never used as a source of energy; if a dog is starved to death, its brain weighs just as much as a litter-mate that has been well fed and then killed at the same time. Myelinization of the central nervous system also is not affected by starvation.

The chapter on the integration of medicine and psychiatry is a most interesting study in psychosomatic medicine, with neurocirculatory asthenia as the syndrome chosen for investigation.

Altogether a stimulating and worth-while contribution to psychiatry.

G. W. T. H. FLEMING.

Current Therapies of Personality Disorders. By BERNARD GLUECK, M.D. London: William Heinemann, 1946. Pp. 296. Price 17*s.* 6*d.*

This volume contains the proceedings of the Thirty-fourth Annual Meeting of the American Psychopathological Association, and is edited by Bernard Glueck, who delivered the presidential address, "Psychiatry: an Instrument of Personal and Social Rehabilitation."

The book is divided into four sections, the first dealing with the modern psychiatric hospital, the second with physico-chemical techniques in psychiatry, the third with psychotherapeutic techniques in psychiatry, and the fourth with psychiatric guidance and rehabilitation techniques.

In dealing with electric-shock treatment we think it wrong to talk about "complete lack of any discomfort on the part of the patient and therefore his perfect co-operation." There may be a difference between American technique and mentality, but it is certain that there is a considerable degree of objection by the patient in this country to electric-shock treatment. The use of curare is deprecated. The writer very wisely emphasizes special management during E.C.T. and for three weeks following. There appears to be too much of a tendency to treat E.C.T. in a carefree manner as an out-patient treatment without any "post-operative" treatment. If possible, hospitalization during and for three weeks afterwards should always be aimed at as a very sound practice.

The chapter dealing with the conditioned reflex treatment for alcoholics is well done and well worth reading. G. W. T. H. FLEMING.

The Physical Background of Perception. By E. D. ADRIAN, O.M., F.R.S. Oxford: Geoffrey Cumberlege at the University Press, 1947. Pp. 95. Price 10*s.*

The Wayneflete Lectures for 1946 delivered in the Hall of Magdalen College were devoted by Prof. Adrian to the path of perception from sense-organ to the grey matter of the brain responsible for sorting out the responses to stimuli.

The book is divided into six chapters devoted to the brain and the mind, the sense-organs, motor and sensory areas of the brain, sight and hearing, the electrical activity of the brain and recognition and mental events.

The best chapter in the book is that devoted to the electrical activity of the brain, where the author gives us a good account of the α rhythm and its development. G. W. T. H. FLEMING.

Suicide and the Meaning of Life. By M. VON ANDICO. London: William Hodge & Co., 1947. Pp. xv + 219. Price 8*s.* 6*d.*

This small book is a study of attempted suicide amongst individuals sent by the police commissioners in various districts in Vienna. The author makes the assumption that because 100 cases of hers have attempted suicide, they

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had come to feel that life was meaningless. Most of her statistics are valueless, as they are not compared with comparative age-groups of the non-suicidal population. When *will* writers learn to present control material so that their *results* may have *some* meaning, as well as life. G. W. T. H. FLEMING.

The Psychology of Behavior Disorders. By N. CAMERON, M.D. Boston: Houghton Mifflin Co., 1947. Pp. 622. Price $5.

This book is written by a psychiatrist with a Ph.D. in psychology. A considerable proportion of the book is devoted to the psychoneuroses, which is very much in its favour.

The author's outlook is primarily a biosocial one, which is quite different from the prevailing psychosomatic approach and is more in line with the teaching of Adolf Meyer.

When *will* someone write about the psychopathology of the completely normal adult (if such exist!)? How many of these normal and healthy people can also say, "My mother never expected to raise me"?

There is far too much tendency in modern psychology to assume that because a child fell on the back of its head it must blame all subsequent aberrations of conduct on this—but have not 100 per cent. of children fallen on the back of their heads, been shut in dark cupboards, been frightened by a furry animal?

The author rather tends to pooh-pooh the fatigue syndrome, effort syndrome or what others call neuro-circulatory asthenia.

In a more advanced degree how familiar the experienced psychiatrist is with blue hands and feet, and if he has had an adequate pathological training, with small hearts and small aortas.

Neurocirculatory asthenia is a very real constitutional condition, and is therefore not an easy condition to treat.

Will medical writers ever cease using the expression autoerotism when they mean masturbation?

These, however, are small blemishes in a book which is very readable and very much worth reading. G. W. T. H. FLEMING.

Practical Psychiatry and Mental Hygiene. By S. W. HARTWELL, M.D. New York and London: McGraw-Hill Book Co., Inc., 1947. Pp. 439. Price $3.75.

This volume in the McGraw-Hill series in nursing is written, so the author states, "to help the student develop a dynamic interest in psychiatry, to make psychiatry more easily understood, to make the teaching of psychiatry practical and to permit flexible use of the text."

The book is arranged in four parts, the first dealing with psychiatry as a whole, the second with the basic medical sciences and with psychology, the third with descriptive psychiatry, and the fourth with the mental hygiene of children and adults.

The bibliography is rather too extensive and technical for most of those who will read this book.

The book is very well done and pleasant to read, and would prove a great boon to many medical men. G. W. T. H. FLEMING.

A Text-book of Mental Deficiency (Amentia). By A. F. TREDGOLD, M.D., F.R.C.P. Seventh edition. London: Baillière, Tindall & Cox, 1947. Pp. 534, with 47 plates. Price 30s.

It is not necessary to say much in praise of this well-known text-book. It is the best book on mental deficiency in the English language. The writer has added a considerable amount of new matter, but might have added a lot

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more on present-day mental testing, together with the changes arising from the Education Act, 1944.

At the same time one does wish that the term amentia could be dispensed with and the term oligophrenia used instead. The word amenza in Italian means confusional insanity, and is so used, and in Holland also amentia is regarded as confusional insanity. G. W. T. H. FLEMING.

The Neocortex of Macaca Mulatta. By G. VON BONIN and P. BAILEY. Illinois: The University of Illinois Press, 1947. Pp. 163 and 62 plates. Price 20*s*.

This is one of the volumes of the Illinois monographs in the Medical Sciences based on microscopical work done in the Department of Neurology and Neurological Surgery of the University of Illinois.

The macaque cortex lends itself to a more natural subdivision into functional areas than the human cortex. The occipital cortex is concerned primarily with vision, the parietal with somaesthetic and acoustic sensations, and the frontal cortex may also be a functional unit. The human cortex is, of course, a more elaborate affair. There does, however, appear to be a common primate pattern, but much more work must be done on the primate cortex before any conclusions can be drawn.

The body of the book is largely a description of the plates, which are very well reproduced.

There is an excellent bibliography.

The book, although entirely one for the research worker and specialist, is well worth reading by those whose comparative neuroanatomy is equal to it! G. W. T. H. FLEMING.

Diseases of the Nervous System. By W. RUSSELL BRAIN. Geoffrey Cumberlege at the Oxford University Press, 1947. Pp. 987 + xviii, with 79 figures. Price 37*s*. 6*d*.

The third edition of this most excellent text-book of neurology needs little introduction. The first two editions were extremely well done, and this one lives up to the standard set.

The most striking addition is the chapter on nutritional disorders of the nervous system. Here we think some mention of sub-clinical pellagrous states might have been included. These are not uncommon in this country, and are not confined to the inmates of mental hospitals. There is also added a section on the status of psychogenic symptoms and psychotherapy, and another on psychometric tests. This latter section is rather scrappy; it is a very wide subject, and if it is going to be dealt with should be dealt with at greater length—probably much greater length than is suitable for a text-book of neurology.

The author describes the use of penicillin in the treatment of neurosyphillis and of meningitis. Illustrations of typical electroencephalograms have been added.

The book has been improved, and possibly the greatest compliment one can pay the author is to say that it resembles even more closely than the previous edition, Kinnier Wilson's monumental classic.

G. W. T. H. FLEMING.

Neurology. By KNUD H. KRABBE, M.D. London: Humphrey Milford, Oxford University Press, 1941. Price .

This book, which was published as long ago as 1941, consists of lectures given by the writer to his students in Copenhagen during the last 23 years, and is intended primarily for students and general practitioners.

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There is a sound account of the methods of clinical examination of the nervous system, and all through the book the author quotes his own experience.

A most readable book, and one which will be read with benefit as a supplement to most text-books and giving the Danish point of view.

G. W. T. H. FLEMING.

Studies on the Morphogenesis of the Brain in Reptiles. By KNUD H. KRABBE. Copenhagen: Einar Munksgaard, 1939. Pp. 87, with xxiii plates.

Studies on the Morphogenesis of the Brain in Lower Mammals. By KNUD H. KRABBE. Copenhagen: Einar Munksgaard, 1942. Pp. 124, with xxxi plates.

Studies on the Morphogenesis of the Brain in Hydracoidea, Ungulata, Carnivora and Pinnipedia. By KNUD H. KRABBE. Copenhagen: Einar Munksgaard, 1947. Pp. 107, with xxx plates. Price 35 Dan. Cr.

These three beautifully produced books are from the Tornblad Institute for Comparative Embryology at Lund, Sweden.

In the first volume the author chose an example from each of the five orders of reptiles, and tried to obtain stages from each corresponding as near as was possible. When the diencephalon occupies a large volume and the mesencephalon is not yet divided into its two hemispheres the brains begin to develop in very different directions. The possible common ancestors of the reptiles go far back; differentiation between the various orders began at a comparatively early stage. The early divergence of the brain of the chameleon from other reptile brains shows that it is comparatively far removed from other Saurians.

In the second volume it is pointed out that the brains of the lower mammals resemble those of the Saurians. However, the hypothalamus occupies more space. The cerebral development of Echidna sets it apart from other lower mammals, but it is more closely related to them than to the Saurians.

In the third volume the author includes a description of a lion embryo of 5 mm.—surely a *very* rare possession; seals are an unusual group. The concluding chapter on the general development of the brain is very well done.

The illustrations in both books are very fine, and a very good indication of the standard set in work of this type from the Scandinavian countries.

G. W. T. H. FLEMING.

The Practice of Mental Nursing. By MAY HOULISTON. E. & S. Livingstone, Ltd.

This little book condenses into 158 pages a very wide range of practical advice to the beginner in mental nursing. Miss Houliston, formerly Senior Sister Tutor and now Matron of the Crichton Royal Hospital, comments in her preface on the fact that the curriculum provided for the first-year nurse offers no instruction on the everyday psychiatric problems met with in the wards. Her book is intended to fill this gap, and to supplement the rather academic early period of training.

The author preserves a colloquial style which makes for effortless reading, and the use is avoided of all but the most essential technical terms. Almost every page is devoted to purely practical matters, and even the preliminary historical survey of psychiatric development says no more than is necessary to giving the student an understanding of the scientific, as distinct from the emotional attitude towards mental disorder.

The main points are summarized at the end of each chapter. The student will not be disheartened on reading the rather formidable list of qualities considered to be desirable attributes of a good nurse, for Miss Houliston clearly

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follows St. Paul in believing that charity is the foundation of all other virtue and she emphasizes that good nurses are made, not born.

The chapter on normal psychology is concise, and the author's teachi experience is revealed by her use of diagrammatic illustrations, and the subsequent transposition into the field of practical issues. However, t impossible task is attempted of describing the basic features of dynam psychology in a matter of three pages, and the degree of dogmatism essenti to good teaching is, at this point, overstretched.

Only the more important psychoses and neuroses are briefly described, a befits a work of this kind, but their accompanying disorders of behaviour an the appropriate nursing attitudes and actions respecting them are excellentl portrayed. Attention is given to the various ways in which a nurse may giv the newly-admitted patient that all-important good first impression of th hospital, and a chapter is devoted to matters and problems particularly affect ing nurses on night duty. Any nurse who commits to memory the wealth o practical advice given should find herself never at a loss in dealing with an of the usual daily problems.

Occupational therapy is given the prominence it deserves, and the ways in which the nurse, as well as the occupational therapist, play a part in furtherin this essential form of treatment are dealt with admirably.

The final chapter briefly describes the functions of a psychiatric soci worker. It fails to harmonize with the main subject matter, and could b omitted without detriment to the work as a whole.

The book represents an ample achievement of the author's purpose, and should prove to be a very acceptable and useful standard issue in any prelimi nary training schools for mental nurses. OTHO FITZGERALD.

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Part III.—Bibliography and Epitome.*

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alization of Intracranial Tumors by Electroencephalography.

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(Authors' abstr.)

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Tridione Therapy.

1. A progress report of clinical observations in the therapeutic use of tridione on 136 cases of varied neurological manifestations, over a period of 2 years, is presented.

2. As previously reported, most spectacular benefits were obtained in cases of *petit mal*, where clinical improvement was immediate, associated with improvement in the EEG pattern, and sustained often after cessation of the drug.

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3. Tridione appears to be useful as an adjuvant drug in the treatment of *grand mal* seizures, though it does seem to aggravate some cases.

4. Both *grand* and *petit mal* of the idiopathic type were more responsive than those due to organic lesions.

5. Anticonvulsant action is indicated by its beneficial effects in cases of tetanus.

6. Tridione is of value in cerebral palsy, especially for reducing tension of the athetoid type.

7. Some forms of behavior disturbances are sedated by tridione.

8. Site of action for tridione appears to be the mid-brain and (with some selectivity) the basal nuclei, an inference drawn from its failure to help patients with pyramidal lesions, while markedly benefiting extra-pyramidal lesions, with the exception of chorea, parkinsonism, and dystonia.

9. Toxic side-effects in the use of tridione, in the author's experience, were rare in children, were generally innocuous, and seemed readily reversible with cessation of the drug. More severe reactions were seen in adults.

(Author's abstr.)

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Report on Lobotomy Studies at the Boston Psychopathic Hospital.

It is clear that the results of prefontal lobotomy are quite variable. Clinically a few cases are dramatically improved and may be restored to a healthy efficient life in the community, a rather large number are partially improved or rendered more comfortable, and a good many are essentially unchanged. There is always a small but definite risk to life, and there is always the possibility of producing new and undesirable symptoms. As yet, we are quite unclear as to the exact indications for the operation. However, we would venture the opinion that by selection of early and relatively well-integrated cases we would get a better percentage result. We would go on record as saying: that lobotomy is a good method, perhaps the foremost method, for the treatment of the chronic mentally ill patient.

The changes in the personality are very variable and complicated and great caution should be exercised in interpreting psychological results. There is no question that prefontal lobotomy offers a very rich field for research.

(Authors' abstr.)

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The Significance of Alpha Variants in the EEG, and their relationship to an Epileptiform Syndrome.

1. Evidence has been presented to show that the cerebral psychomoter patterns of Gibbs, Gibbs and Lennox are related to certain variations of the 10-cycle or alpha rhythm of the brain, which have been termed alpha variants. The most common variants consist of a halving or doubling of the alpha rate.

2. Even in cases of known psychomotor epilepsy the amount of the alpha variants recorded in the EEG between attacks may vary widely both among and within individuals, but practically all such patients show traces of the variants between seizures.

3. There is a high incidence of alpha variants in certain other conditions, notably psychoneurosis and idiopathic epilepsy. Their presence in the so-called psychoneurotic group shows a high correlation with a symptom complex that includes cranialgia, episodic changes in levels of consciousness, and emotional and vasomotor disturbances.

4. A high incidence of alpha variants among patients with *grand mal* epilepsy has been noted. The alpha variants may be correlated in these cases with altered states of consciousness (which cannot be identified electroencephalographically with *petit mal*), or with neurotic traits superimposed on the major epilepsy. It is concluded that mixed epilepsy of a *grand mal*-psychic variant type is of frequent occurrence.

5. The alpha variants are not pathognomonic of the epileptiform states. The significance of their appearance in the EEG without the accompanying symptom complex, as in the case of a small proportion of presumably normal individuals, has not yet been elucidated.

6. The alpha variants are of diagnostic assistance in cases where the neurological findings are essentially negative, and where the EEG is otherwise within broad normal limits. Under these circumstances, their presence in the EEGs of patients with vasomotor instability (cranialgia, dizziness, etc.), emotional disturbance of an episodic nature, or changes in the state of consciousness, indicate that the condition may be related to an epileptiform syndrome, rather than to a purely psychosomatic etiology.

7. The term psychomotor epilepsy is inadequate to describe the entire range of psychic variants in the epileptiform syndrome, and in the author's opinion should either be replaced by a more descriptive term, or its use restricted to conditions in which motor manifestations of a bizarre nature are present. (Author's abstr.)

EEG Studies in Idiopathic Epilepsy, Idiopathic Syncope and Related Disorders.

The physiological and psychological factors relating to idiopathic syncopal attacks are discussed since this symptom was predominant in the group discharged with non-epileptic diagnoses.

The symptoms produced by arresting cerebral circulation in man and the syncopal attacks observed in certain cases of personality disorder and psychoneurosis are compared.

The ultimate discharge diagnosis and EEG correlation were considered in 469 patients admitted with a diagnosis of epilepsy or a possible convulsive disorder, and analysis showed that less that half were discharged from the naval service with a diagnosis of epilepsy and that the EEG abnormalities were significantly higher in this Group.

Of 469 cases admitted with the possibility of a convulsive disorder 147 were discharged with a diagnosis of personality disorder and 62 with the diagnosis of psychoneurosis which made up about 44 per cent. of the admission group.

Analysis of 206 cases discharged from a U.S. Naval Hospital with a diagnosis of epilepsy is presented. The EEG findings are compared with a control group. There is a similarity between Gibb's series of EEG findings in 730 adult epileptics and with his series of " controls."

Nineteen cases or 9·6 per cent. of the series gave a history of head injury 1–10 years prior to their first convulsive seizure.

Of these 19 cases, 11 had abnormal EEG, 5 of which were focal in type.

Of this series 127 patients had been observed in typical *grand mal* seizures and of this group 63 per cent. had greatly abnormal EEG and 11·8 per cent. showed slightly abnormal EEGs.

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Typical *petit mal* histories in this series were rare as were typical *petit mal* waves in the EEG tracings. A possible explanation for this may be that all of the patients considered were over 17 years of age and 90 per cent. of them were in the age group of 17–30 years and the remaining 10 per cent. were over 30 years of age. (Author's abstr.).

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Activated Electroencephalography.

In a series of 97 patients with post-traumatic epilepsy, an attempt was made to activate the epileptogenic focus by hyperventilation, hydration, electric shock, intravenous administration of alcohol, and injection of trimethadione, penicillin, acetylcholine chloride, sodium cyanide and metrazol.

Of these methods, the injection of metrazol proved to give satisfactory focal activation in approximately 44 per cent. of the patients on the first test and in a much higher percentage on repeated testing.

Intravenous administration was more effective than intramuscular injections.

Clinical seizures occurred in approximately 14 per cent. of patients, but not if anticonvulsant medication was given before the test.

The electroencephalographic alterations induced with metrazol included focal slow waves, spikes or, somewhat less frequently, the rhythmic discharge of a seizure. The same alterations were less commonly recorded from all parts of the head.

Activated electroencephalography appears to be a useful diagnostic aid in the understanding of the mechanisms involved in post-traumatic epilepsy.

(Authors' abstr.)

Relation of the Frontal Lobe to the Autonomic Nervous System in Man.

The autonomic nervous system was examined in a control group and in a series of patients who had undergone prefrontal lobotomy. The sympathetic nervous system was tested pharmacologically with intravenous injection of 0·05 mgm. of

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epinephrine hydrochloride (1:1,000). The parasympathetic system was examined by means of stimulation of the carotid sinus reflex. The effects were recorded with the electrocardiograph and the electroencephalograph, and the clinical manifestations were carefully noted.

Subcortical section of the frontal lobes interferes with inhibitory and excitatory autonomic centers in the cortex, resulting in overreaction of the autonomic nervous system to direct stimulation.

After frontal lobotomy autonomic equilibrium is eventually established at a new level and is brought about by readjustments of the autonomic system.

This work confirms other reports that cortical representations of the autonomic nervous system are located in the prefrontal area. (Authors' abstr.)

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Ballism and the Subthalamic Nucleus (Nucleus Hypothalamicus; Corpus Luysi): Review of the Literature and Study of Thirty Cases.

A review of the literature disclosed 30 cases of hemiballism associated with localized pathologic change in the subthalamic nucleus. Analysis of these cases led to the following conclusions:

1. Ballism is a distinct form of involuntary movement characterized by continuous, violent, coordinated activity of the axial and proximal appendicular musculature such that the limbs are flung about.

2. Hemiballism, and sometimes monoballism of the upper extremity, is the apparently inevitable symptom in man of destruction localized in the contralateral subthalamic nucleus (nucleus-hypothalamicus; corpus Luysi).

3. There is evidence that interruption of the connections of the subthalamic nucleus may result in hemiballism.

4. Hemiballism may appear without demonstrable pathologic change in the subthalamic nucleus or its connections, although such cases are relatively rare.

5. Ballistic movements may appear in a variety of dyskinesias, to which the relation of the subthalamic nucleus is as yet obscure. Their similarity to or identity with those of hemiballism following damage to the subthalamic nucleus awaits a more complete, and preferably cinematographic, comparison.

6. Adequate clinical description and pathologic study will continue to be of value in elucidating the genesis and nature of this remarkable symptom.

(Author's abstr.)

EEG Studies on Induced and Excised Epileptogenic Food in Monkeys.

In *rhesus* monkeys the application of a lumina cream to the motor cortex of one side produced a primary focus of EEG abnormality, characterized chiefly by delta activity, random spikes and sharp formations. This abnormality appeared prior to the onset of jacksonian attacks, which could be elicited by physical stimulation. Subsequently, a secondary (mirror) focus of EEG abnormality developed in the opposite motor cortex, which was followed later by generalized convulsions.

A direct correlation was found between the degree of EEG abnormality and the convulsive threshold. Maximal EEG disturbance was usually associated with generalized convulsions. Minimal EEG abnormality was associated with jacksonian attacks and was also present after the cessation of seizures.

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Ablation of Area 4 resulted in eventual cessation of seizures and diminution of EEG abnormalities.

The limiting intravenous convulsant dose of metrazol for monkeys exhibiting epileptic seizures, or for similarly prepared monkeys after ablation of the primary focus, or for a monkey in which alumina cream had been applied subcortically, was significantly lower than that for control monkeys. (Authors' abstr.)

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Traits Related to Improved Adjustment of Psychotics after Lobotomy.

An investigation of the relationships between 199 behavior traits and improvement after lobotomy in 71 hospitalized patients produced evidence of significant association for only 12 traits. Nineteen traits in which statistical relationship was not significant were considered of interest on a purely rational basis. It is argued that the traits considered can be readily classed under two principles of prediction: (1) A heightened activity level is favorable to improved social adjustment after lobotomy. (2) Evidence of cortical domination of efferent pathways is favorable.

A scoring system based on 31 trait items makes a rough prediction possible. In terms of this system the investigator found a critical score above which the operation seems advisable; a lower critical score permits a more cautious prediction of no improvement. (Author's abstr.)

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Losses and Gains on the Alpha Group Examination as Related to Electroconvulsive Shocks.

" In this study five forms of the Army Alpha Group Examination were given to 15 mental patients whose intellectual level and formal schooling were, on the average, above those of the general population. With but few exceptions one test was given: (1) one day after the first shock, (2) one day after the 9th or 10th shock, (3) one day after the 19th or 20th (last) shock, (4) one week after the last shock, (5) about 3 weeks after the last shock." The results indicated a significant decline in test scores from the beginning to the end of the course of shocks, with a significant rise during the time after the termination of shock treatment. It was not possible to evaluate the final scores in terms of pre-illness test level because of the lack of data for these patients covering that period. In some instances where such information was available, the pre-illness test level seemed to be regained within a month after the end of the convulsive therapy.

L. I. O'KELLY (Psychol. Abstr.).

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The Electroencephalogram in Epileptic Patients Aged 5 to 80 Years.

An analysis was made of the electroencephalographic findings in 369 cases of epilepsy (243 idiopathic and 126 symptomatic), aged five to 80 years, between periods of seizures.

Of the 146 patients under 20 years of age, 101 had idiopathic and 45 had symptomatic epilepsy.

Of the idiopathic group the EEG was aberrant in 91 per cent., with wave and spike forms accounting for 27 per cent.

Of the symptomatic group the EEG was aberrant in 60 per cent., with wave and spike forms accounting for 22·2 per cent.

For the combined total of epileptic patients in this age-span the incidence of aberrant EEGs was 80·8 per cent., with wave and spike forms accounting for 25·3 per cent.

Of 223 patients aged 20–80 years, 142 had idiopathic and 81 had symptomatic epilepsy.

Of the idiopathic cases the EEG was abnormal in 63·3 per cent., with wave and spike forms accounting for 16·4 per cent.

Of the symptomatic cases the EEG was abnormal in 54·3 per cent., with wave and spike accounting for 3·7 per cent.

For the combined total of epileptic patients in this age-span the incidence of abnormal EEGs was 61·1 per cent., with wave and spike accounting for 11·6 per cent.

On the whole, there was a lesser incidence of electroencephalographic abnormality among symptomatic than among idiopathic cases. Up to the age of 25 years, in cases of either idiopathic or symptomatic epilepsy, wave and spike forms showed a significantly higher incidence among younger patients. After the age of 25 years the symptomatic group showed a negligible incidence of wave and spike abnormalities, whereas the idiopathic group still displayed an appreciable, although waning incidence of wave and spike forms.

When the electroencephalographic abnormalities consisted of wave and spike forms, the case was more apt to be idiopathic, whereas when the abnormality consisted of either unilateral asymmetry, or generalized or isolated spikes, the case was more apt to be symptomatic epilepsy. (Authors' abstr.)

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1. The development of a specific musical stimulus to fit production is described in an epileptic woman.

2. Extensive clinical investigations failed to reveal an acquired cerebral lesion, although the fit pattern, optokinetic response, and inter-seizure EEG indicate an epileptogenic area in the left temporal lobe.

3. Increases of blood pressure, heart rate, and respiration while listening to music were observed in this patient. These were associated with overt signs of emotion.

4. Fits could not be induced by pure tones, although the patient felt emotional to a tone of 512, which persisted, and was varied in loudness. Different kinds of music were invariably followed by a fit within five minutes.

5. Electroencephalographic studies showed a constant pattern for the development of the fit. No change of rhythm was seen while music was played before the fit began. The cortical discharge began six or seven seconds after the clinical onset. This discharge consisted of 6 c/sec. low voltage potentials having bilateral synchrony, steadily increasing in voltage and falling progressively in frequency to reach $2\frac{1}{2}$–3 c/sec.

6. The possible mechanisms of fit production are discussed.

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1. Biochemistry.

Inactivation of Certain Neurotropic Viruses in Vitro by Serum Lipides. Casals, J., and Olitsky, Peter K. (Rockefeller Inst., New York, N.Y.). [*Science*, **106**, 267–8 (1947).]

Serum lipides from mice, rabbits, hamsters, and horses reduced the potency of St. Louis, Russian, Far East, and Japanese *B. encephalitis* viruses. The lipide fractions were obtained by acetone-ether or hot alcohol extractions, and were emulsified in buffer saline solution before incubation with virus (infected mouse brain suspension) at pH 7·0–7·2 and 37° for periods up to 24 hours. The viral inactivation took place also in the presence of serum protein at 2–4°, although more slowly. The inactivating agent was not dialyzable and withstood heating at 99° for 1 hour. Its ability to change surface or interfacial tension showed no correlation with its antivirus action. When serum was extracted in succession with acetone, Et_2O, and hot EtOH–Et_2O, each extract was effective against virus. Whole lipides from egg yolk were inactive, those from brain moderately active. Of various brain lipide fractions, the acetone extract was markedly active, the Et_2O and hot EtOH–Et_2O extracts were only moderately so. The results may have bearing on the neutralization test for neurotropic viruses, and on chemotherapy of infections by them. MARION HORN PESKIN (Chem. Abstr.).

The Role of Acetylcholine in the Organism. Danielopolu, D. (Première clinique méd., Bucarest). [*Ann. méd.*, **47**, 121–8 (1946).]

The function of acetylcholine (AC) as a transmitter of nerve impulses is briefly discussed. In immunity processes the antigen in contact with the body cells liberates AC which in turn causes the production of globulins. The latter, in contact with the antigen, acquire the qualities of sp. antibodies. If the antigen is present in the organism for a longer time it causes an excessive formation of AC-precursor substance. Although AC is not a constituent of the antibody, it is in close connection with it. The introduction of antigen into the immunized organism causes the formation of the immunity complex, antigen-antibody-alexin, with the liberation of AC, the latter eliciting the anaphylactic shock. The types of antibodies that use alexins (cytolysins, bacteriolysins) cause reactions of an explosive nature. Other antibodies, like agglutinins, antitoxins, and precipitins, do not require alexins and act slowly with limited AC release. If the antigen is introduced into the organism in quantities too large to be destroyed by the antibodies, then a part is incompletely disintegrated and a sp. " apotoxin " is formed, which causes the symptoms of the disease. The development of the disease determines a second phase of immunity formation. Increased metabolism, as produced by infection, involves a higher consumption of AC which leads to tachycardia. When the immunity process has increased the AC production sufficiently to obtain adequate immunity, a shock, corresponding to the crisis in pneumonia, sets in, characterized by hypotension, bradycardia, eosinophilia, leucopenia and monocytosis. The defense mechanism of an organism is determined by the ratio of AC formation and cholinesterase. Eserine inhibits cholinesterase and also adrenolytic factors. The digitalis glycosides have the same action. Consequently digitalis should not be used as an exclusive cardiac agent but as a means of raising the " vegetative tonus." Eserine could serve the same purpose but its action is of too short duration. Both drugs favor the anaphylactic shock, which is prevented by atropine. The simultaneous application of digitalis with imunizing agents leads to increased immunity. It is admitted that histamine plays a role also. It is liberated by the action of the apotoxins on tissues. A. E. MEYER (Chem. Abstr.).

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The Effect of X-rays on the Vegetative Nervous System. Nemenov, I. M. I. (Central Roentgenol. Radiol. Cancer Inst., Moscow). [*Am. Rev. Soviet Med.*, **4**, 446–8 (1947).]

Radiation therapy is of value in ulcerative diseases, jejunal ulcer, hypertension, Basedow's disease, and pericolitis complicated by severe constipation. The favorable effect on gastric ulcer and gastric crisis depends on the action of X-rays on the vegetative nervous system. Sugar and Ca contents of the blood are stabilized when either too high or too low, and gastric hyper- or hypoacidity is regulated. No changes were observed in patients who had a normal blood sugar or Ca, or a normal HCl in the gastric juice. In certain cases of chronic eczema with disturbed equilibrium of the vegetative nervous system, radiation was of value when administered to the corresponding segments of the spinal cord, as well as of the hypothalamus. W. R. HENN (Chem. Abstr.).

Development of Nervous Activity and Chemical Factors of Nervous Activity in Cats. Kakushkina, E. A. [*Byull. Eksptl. Biol. Med.*, **22**, *No.* 7, 65–7 (1946); *cf. C. A.*, **40**, 7242[2].]

The amount of acetylcholine-like material and of acetylcholine esterases was determined for the cerebral hemispheres of cat embryos of various lengths, for new born kittens and for kittens 2, 5, 7, 11 and 20 days old and for kittens 4 months old. The increase in acetylcholine-like materials is not a linear function of growth. Values for acetylcholine in γ were: for 5·5-cm. embryo 0·30, for 8-cm. embryo 0·23, for a kitten 2 days old 0·90, for 5 days old 0·60, for 7 days old 0·70, for 11 days old 0·54, for 20 days old 0·32 and for 4 months old 0·40. Esterase development did not follow the same pattern as growth in acetylcholine-like materials. Activity of esterases as measured by the amount of acetylcholine in γ increased throughout embryonic life and reached a maximum in the kitten 2 days old. Even at 4 months the degree of activity of esterase as measured by the acetylcholine destroyed in 15 minutes (0·45 γ) was larger than the maximum found in embryonic life (0·17 γ) in the case of the 8-cm. embryo, but was not as great as in the newborn cat (0·72 γ). N. M. P. (Chem. Abstr.).

The Occurrence of Citrate in Human Cerebrospinal Fluid with Special Consideration of the Difference between the Citrate Content found by Lumbar and by Subarachnoid Puncture. Benni, Bertil, Larsson, Hans, and Thunberg, Torsten. (Univ. Lund, Sweden). [*Kgl. Fysiograf. Sallskap. Lund, Forh.*, **13**, 91–7 (1943) (*Pub.* 1944) *(in German) : cf. C. A.* **24**, 4549, 5827.]

Normal values for citric acid (I) in cerebrospinal fluid (II) (in γ per ml.) were 45–55, as determined by the methods of Pucher *et al.* (*cf. C. A.*, **30**, 2597[8]) and of Thunberg (*C. A.*, **27**, 5770). The average normal value was 50. In meningitis, syphilitic nerve diseases and vascular lesions, (I) increased to 50–100 (or more). Lower values occurred in epilepsy, hydrocephalus, and brain tumors with increased intracranial pressure, but (I) was never totally absent from (II). Amounts of (I) in the (II) of the following numbers of epileptics were : 4 (under 30), 19 (31–35), 10 (36–40), 7 (46–50). The arithmetrical average value was 31 γ per ml. The amount of (I) in normal serum is 20–25, about half the amount in (II). Ratios between various constituents in serum and in (II) are discussed. Ca and Mg are probably present to some extent as complex univalent " calcitrate " and " magnecitrate " ions, respectively. Average values for the amount of (I) in (II) in different diseases by subarachnoid and by lumbar puncture, respectively, were: acute encephalitis, 40, 53; chronic encephalitis, 39, 56; epilepsy, 34, 47 ; cerebral hemorrhage, 35, 58 ; cerebral arteriosclerosis, 36, 72 ; hypertonia, 28, 53 ; cerebral tumor, 49, 63 ; cephalalgia, 28, 51. Average values for all the pathological conditions were 36 and 57, respectively. Results are discussed but without any very definite conclusions. W. C. TOBIE (Chem. Abstr.).

Certain Hormones in the Cerebrospinal Fluid. Myasnikov, A. L. (Naval Med. Acad., Leningrad). [*Klin. Med. (U.S.S.R.)*, **23**, *No.* 12, 156–63 (1945).]

Intravenous injection of freshly drawn spinal fluid (5–10 c.c.) in human cases leads to a sharply raised blood-sugar level, i.e. the action is similar to that of the

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hypophysis hormones. The rise is of the order of 20–5 mgm. per cent. and lasts about 2 hours. The donors showed a significant drop of the sugar level, which was especially pronounced in diabetic patients where drops of 50–150 mgm. per cent. over several hours were observed. The recipients showed in some cases a slight rise of blood pressure although if the donor was a hypertonic individual, the blood pressure of the recipient gave a fairly pronounced rise for several hours. The pressor effect was also given by donors with diabetes or acromegaly. Since the pulse is not affected, the hormone involved is not the adrenotropic hormone. The donors gave an opposite picture of blood-pressure variation, but also showed a distinct rise of blood cholesterol, which levelled off within 3 hours. The greatest changes again occurred in diabetic patients. The effects described are linked to hypophysis hormones which penetrate into the spinal fluid.

G. M. KOSOLAPOFF (Chem. Abstr.).

The Pituitary Gland and Carbohydrate Metabolism. I. The Posterior Lobe. Corkill, A. B., and Nelson, J. F. (Baker Med. Research Inst., Melbourne, Australia). [*Med. J. Australia*, **34**, 130–4 (1947).]

The antagonism between posterior pituitary lobe extract and insulin on blood sugar was studied in cats, usually under amytal anaesthesia but sometimes under spinal. Eviscerated preparations were sometimes used. Posterior pituitary extract "surgical," which was employed, appeared to provoke a secretion of adrenaline which counteracted the insulin hypoglycemia.

II. *The Anterior Lobe. Ibid.*, 172–4.—The effects of anterior pituitary extract and insulin on glycogen and sugar content of the rat diaphragm musculature was studied by means of a modified Gemmel technique previously described. The initial glycogen content of muscles in rats treated with anterior pituitary extract was lower than in normal muscles. In Ringer's solution without insulin 90 per cent. of the glucose that disappeared could be accounted for by oxidation. With insulin, the extra glucose disappearing in the muscle strips could be accounted for by the deposition of muscle glycogen. The amount of glucose that disappeared from the strips of muscle prepared from rats treated in the absence of insulin with anterior pituitary extract was of the same order as that observed in normal animals. These findings are discussed. G. H. W. LUCAS (Chem. Abstr.).

Disturbances in the Autonomous Nervous System in B_1-avitaminosis. Selezeneva, I. A. A. [*Farmakol i Toksikol*, **10**, *No.* 2, 3–6 (1947).]

Functional changes were studied in the neuromuscular system of B_1-avitaminotic rats with the Magnus method. Adrenaline (I), acetylcholine (II), and $BaCl_2$ (III) were tested for depressant and paralytic effects on the autonomous innervation system of intestinal musculature. A direct relation was observed between neuromuscular effect and duration of avitaminosis. There were 3 test groups: 10 rats, 4 months of B_1-free diet; 5 rats, 1 month; 5 controls, normal diet. Drug concentrations in p.p.m. were: (I), 0·005, 0·0067, 0·01, 0·02; (II), 0·002, 0·004, 0·005, 0·0067, 0·01, 0·02; (III) 12·5, 16·7, 25. Serious depression of autonomous intestinal innervation was observed; the effects of (I) and (II) indicate, in addition to inhibition or paralysis of receptor activity, a high content of adrenoxidase and cholinesterase. JULIAN F. SMITH (Chem. Abstr.).

Cholinesterase. Bodansky, Oscar (Edgewood Arsenal, Md.). [*Ann. N.Y. Acad. Sci.*, **47**, *Art.* 4, 521–47 (1946).]

Recent data on cholinesterase (I) suggest there is not 1 or 2 types of (I) but rather a "family" of enzymes which in a general way can be divided into 2 groups. The division is made on the basis of their reaction to increasing substrate concentrations (I) in sera and some tissues obey the Michaelis-Menton formulation while the (I) in red cell and brain are inhibited at higher substrate concentrations of acetylcholine. The effects of pH and various ions on (I) are discussed. Disagreements in the literature are resolved if it is remembered that the studies were carried out on (I) from different sources. The *in vitro* action of various (I) inhibitors is summarized. The sensitivity of (I) to inhibition by diisopropyl fluorophosphate (II) varies, depending on the source, (I) from rabbit serum requiring about 1/10,000th as much (II) as the other sera studied to give 50 per cent. inhibition.

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Administration of (II) to monkeys gave no symptoms even when the serum (I) levels was reduced to zero ; severe toxic symptoms are associated with zero levels of brain (I) activity. Recovery of brain (I) in rabbits poisoned with (II) is exceedingly slow. The inhibition of (I) by (II) is irreversible since dilution or dialysis does not increase activity of (I) inactivated with (II). Attempts to classify (I) from various sources into types such as specific or true and nonspecific or pseudo lose their significance when the comparisons are made using additional criteria such as sensitivity to (II) or activity against triacetin. There is no evidence to suggest that the low serum (I) values found in debilitating diseases are of any special significance, so far as transmission of nervous impulses is concerned.

CARL C. SMITH (Chem. Abstr.).

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Part I.—Original Articles.

LOVE DEPRIVATION AND THE HYSTERICAL PERSONALITY.

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THROUGHOUT medical history we find evidence that hysteria has predominated over all other psychological disorders in attracting the attention of philosophers and physicians, yet despite the leading part which the study of hysteria has played in building up our present-day knowledge of psychopathology, it is remarkable how little we have advanced in acquiring an understanding of the cause of the hysterical syndrome itself. Even the wisdom of Freud has failed to offer us a readily acceptable explanation of hysteria, and to this day medical literature contains many theses suggesting that hysteria is related to disorders of the diencephalon, or to glandular dysfunction, and other such organic approaches to the problem. Seemingly we have no yardstick by which we can measure to what extent the hysteric is born, predestined by some elusive factor to develop the malady, and to what extent hysteria is imposed on persons by environmental circumstances. Much significant information on hysteria may be neglected by those who study it as an isolated phenomenon or disease entity, whereas it may well be that the truth of the matter is that at least a little bit of the hysterical reaction goes to form most of the neurotic syndromes met with in practice, and that the pure hysterical reaction is only an academic concept.

Thesis.

It would be superfluous herein to describe the various theories on the causation of hysteria, such as those of Freud, Jung, Charcot and Kretschmer, since these are adequately summarized in textbooks, of which Sadler's *Modern Psychiatry* is a notable example, and it will suffice for the purpose of this paper to offer only a few passing comments on the inadequacy of these theories.

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Freud gave no explanation as to why the same complex will give rise to obsessional neurosis in one person and hysteria in another, and merely attributed the phenomenon to some vague constitutional proclivity.

Jung's view, that the hysterical personality is only an exaggerated form of the normally extraverted personality, would appear to be refuted by the frequency with which hysterical symptoms are seen in cases of schizophrenia and persons with marked schizoid personality traits.

Kretschmer believes that hysterical manifestations are associated with emotional immaturity, but he does not indicate whether emotional immaturity is a causative factor in hysteria, and whether by immaturity he means a congenital disposition or an arrested development.

It is generally believed that the kind of environmental situations which cause a child to feel unloved or unwanted are conducive to his developing non-specific neurotic personality traits or general neurotic tendencies. The present author's view is that love-deprivation situations specifically give rise to hysterical traits, as distinct from all other neurotic traits. This theory does not rule out the possibility of certain persons having some proclivity towards hysteria because of their inborn or congenital traits, but it does imply that, regardless of the nature of an individual's inborn tendencies, he will not develop hysteria unless he is subjected during childhood to situations causing him to crave affection. Thus, in the development of an hysterical personality, the love-deprivation situation is the deciding factor, and any inborn tendency towards emotional immaturity merely sensitizes the individual towards the causative situation, and affects the result only in degree and not in kind.

The love-deprivation situation experienced by the growing child creates in him a habit of love-craving, and this emotionally dependent attitude is the basic trait from which all other features of the hysterical personality spring. A person who has developed the hysterical or love-craving trait will not for that reason alone suffer an hysterical illness, because, as in the beginnings of all other forms of neurosis, an emotional conflict or crisis is the final precipitator of an attack of hysteria. There is no particular form of emotional conflict which is peculiar to hysteria as the final precipitator of the illness, and the selection of hysteria as a means of seeking a resolution of emotional conflicts is dependent on factors and emotional experiences which antedate the immediate or precipitating conflict. Even when the precipitating conflict is a very violent one, as has so often been noted in battle casualties, hysteria does not result from it unless the individual's conflict has been preceded by a conditioning towards love-craving. McGregor (1), for example, in analysing the findings in 2,228 consecutive patients admitted to a military hospital for neurosis, found that 48·01 per cent. formed a personality group having the traits of timidity, immaturity, dependence and frustration. "They came from broken homes or homes where there had been much emotional stress in early life. On the whole, this group revealed marked evidence of love-deprivation in childhood." It is probable that the intensity of emotional conflict necessary to precipitate an attack of hysteria is inversely proportional to the degree to which the individual has previously developed a love-craving, and this would serve to explain the occurrence of hysterical symptoms in a

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person who previously showed no obvious proclivity towards developing hysteria.

This theory offers an explanation of some of the hitherto elusive features of hysteria, and it helps to clarify the ways in which the hysterical personality attempts to sublimate his emotional handicaps.

Most textbooks of psychiatry and general medicine include in their description of hysteria certain time-honoured observations, such as, that hysteria is more common in women than in men; that it is more common in certain races of mankind than in others; that it is more common in persons lacking in normal development or maturity; that hysterics are more suggestible than are normal people; and that hysterics are prone to have fits which bear a superficial resemblance to epileptic ones. Not all these observations are universally accepted, but they have held sway for such a long time that they may serve as a preliminary testing ground of the validity of our theory.

Sex Incidence.

Nowadays if almost all the patients in any women's ward of a general hospital were suddenly to throw hysterical fits the physician would be at least surprised if not horrified, but such a thing was by no means uncommon in any English hospital a century ago according to so eminent a writer of that period as Thomas Watson (2). We naturally turn to environmental factors in seeking an explanation of the decline in such outbreaks of mass hysteria, but the emphasis on sex-equality of our modern social system hardly answers the question. The woman of some generations past was probably not much dominated by masculinity in general, but rather was she dominated in an autocratic manner by the male head of her personal household. When a blind obedience towards the master of the house was the order of the day, not only for the children but the adult womenfolk of the house as well, it was to be expected that women should retain the feeling of dependence and the emotional immaturity of children, and that, like children, they should react to stress by emotional, rather than rational, modes of self-expression.

Faced with the statistical evidence of two world wars, no doctor could nowadays uphold the former view that the male sex has any marked immunity to hysteria, but in regard to the cases seen in everyday practice, the gross and more obvious symptoms of hysteria are seen more frequently in women than in men. Thus it is necessary for us to seek an explanation of this sex-incidence, which seems to persist despite the social freedom and sex-equality enjoyed by the modern woman.

Anyone who has tried training a dog to the gun knows that to reach perfection one must feed the animal personally, otherwise its first love will be for the feeder's and not the trainer's hand. And so with men, we may say that love finds its beginnings in the stomach, as is evidenced by the behaviour of infants, and indeed all children regard mother, and not the somewhat abstract father-breadwinner, as the real provider of daily sustenance and comfort, and therefore the one whose love is most desirable. Mother is the giver of security, and the child chooses her as the first object on which to exercise the mechanism of identification with all the by-play of imitation. The awareness of their

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sex-similarity is conducive to girls having a stronger tendency than boys towards mother-identification, and it may thus be expected that girls should suffer the greater emotional trauma when mother, for any reason, fails to maintain her status as the most loved and lovable one.

Furthermore, we note that the little girl in her play naturally turns to domestic things more than the little boy, and to a degree which cannot altogether be attributed to a tradition forced on her by the nature of the toys presented to her, or by other such parental attitudes. From the beginning a little girl is a little mother, doing loving things to her dolls, and in such ways showing that she attaches more value to the composite love bonds of the home than does her little brother. Thus she is more sensitive than her brother towards factors which tend to weaken the love bonds between her and the persons who go to form her concept of home and security. The greater incidence of hysteria in women therefore tends to support the writer's view that hysteria is born out of a disruption of the normal love-bonds of the child.

Racial Incidence.

It has often been stated that hysteria is more common in Latin than in Nordic races. This opinion is no doubt based on an association between hysteria, volatile emotions, and a British concept of the Gallic temperament, rather than any racial emphasis arising out of Charcot's work. Jews are regarded as being more susceptible to hysteria than Gentiles, and the same is said of any race having the characteristic trait of not placing any great curb on the outward show of emotion. There is no strong evidence that Jews are, in fact, more prone to suffer from hysteria than are any other races, but if it is true, the explanation surely lies not in their having any characteristic emotional lability, but rather in their familial loyalty, and their exemplary devotion towards their children. In this respect we may apply the platitude "what has never been experienced is little missed," and, by not shunning the obvious, we may regard the over-loved child as being more sensitive to shortcomings in affection than the child who is not thus emotionally conditioned.

Markham (3) believes that climate affects the energy of nations, and gives examples of how energetic races of settlers have lost their drive in a few generations after settling in an adverse climate. We commonly associate hot climates with hot-bloodedness, unrestrained passions, and thus with the emotional lability of the hysteric. However, whether or not it is true that a warm climate predisposes a race towards more labile emotional reactions, it is quite clear that by living in a cold climate a race gains no insurance against an hysterical tendency. Cooper (4), for example, remarks on the common occurrence of hysteria amongst the Eastern Crees, a people who live in the region of Hudson Bay, as well as amongst Eskimos and Siberian Arctic people.

Kimball Young (5), quoting from a monograph by Gregory Bateson and Margaret Mead (6), dealing with the Balinese character, states that the Balis are particularly liable to exhibit hysterical dissociations, and they have complicated ceremonials and rituals. Bali infants are at first treated with great indulgence by their parents, but later are subjected to severe teasing, rejection and denial of love.

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The same author, again quoting from Margaret Mead's work (7), describes certain characteristics of the Mountain Arapesh natives, which make an interesting comparison with those of the Balis. The Mountain Arapesh children are treated with great parental indulgence, and are taught to love and trust everyone. Few of these children show temper tantrums, and their aggressive tendencies are vented, not on persons, but on the physical world. Maloney (8) draws a somewhat similar comparison between the natives of Okinawa and those of Guam. The Okinawans are stoical and remarkably immune to neurosis, whereas the Guamanians are much lacking in these qualities. Maloney believes that these differences are not due to genetic factors, but result only from racial customs governing the attitude of the parents towards their children.

It is of course true that like breeds like, in the sense that an hysterical mother tends to create hysterical tendencies in her children. The following is a typical example:

Mrs. E. W—, aged 31, had suffered from headaches, bearing-down pain, and vaginal discharge since the birth of her only child. Although her confinement was singularly free from discomfort, her nerves were subsequently so bad that her child Michael was given over to the care of a foster mother for the first three months of his life. For seven years she was treated conservatively for retroversion and a vaginal discharge by a gynaecologist, who refrained from doing a surgical operation to relieve the condition by reason of the patient's nervous state. When she had thus suffered for seven years it became apparent that the extent and degree of her symptoms were disproportionate to the minor degree of her organic disorder, and she was therefore referred to a psychiatrist. The patient's history indicated that she came from very healthy and stable stock. She was the youngest of five sisters, and all members of her family had always enjoyed robust health. However, the patient herself had experienced great delicacy in childhood, particularly from the age 7 to 14, when she was thought to have had pulmonary tuberculosis, and during which time she suffered a host of more minor ailments, so that she had little or no schooling and was a great worry to her parents. Despite such handicaps she left home to undertake work at the age of 14, and immediately thereafter she recovered her health and remained free from any illness until, when she was aged 23, her son Michael was born. She had married at the age of 19, and a year later her first-born child died from gastro-enteritis shortly after birth, but her health was unaffected by this incident. To the psychiatrist she complained, in addition to the afore-mentioned symptoms, that frequently she wept almost the entire day because of a nausea which caused her to retch continually. At such times she could not bear her son Michael to be near her, and the child had so goaded her to distraction that she had thrashed him with a leather strap until his body was covered in weals. Michael, she said, was an affectionate child but too demanding upon her, and he flew into rages if she failed to obey his wishes. When thwarted he had threatened her with a carving knife, had torn up his clothes, and had thrown things out of the window. He continually twitched his nose, made a peculiar sniffing noise, and also displayed the odd mannerism of shrugging his shoulders as he walked. The child had suffered much with chest trouble, and indeed for two years his mother suspected he might have pulmonary tuberculosis, so that she had perforce to treat him with the care appropriate to a delicate child. She commented on how remarkable it was that, despite his appallingly bad behaviour when at home, the child behaved quite normally whilst at school.

In recording the clinical data of cases, such as the above, where hysterical symptoms have appeared in successive generations, one finds little evidence to support the view that hysteria is transmitted by an hereditary factor, but, on the contrary, one finds ample evidence that the hysterical tendency is

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environmentally imposed. In all probability a racial proclivity to hysteria is bound up with racial customs governing the attitude of parents towards their children, especially in regard to the degree and constancy of affection which is shown them.

Lack of Maturity.

On the face of it the hysterical reaction seems to be a primitive or unintelligent mode of defence. It is the only well-defined neurotic reaction which we observe in the lower animals, and one the operation of which would seem to put no tax on intelligence. Kretschmer (9) regards hysterical manifestations as being predominantly vague, impulsive ways of reaction occurring in simple, primitive, or immature persons, and considers that it appears relatively seldom in enigmatic, highly differentiated personalities possessing intricate richness of experience.

Miller (10), commenting on the lower incidence of gross hysterical reactions in soldiers during the recent war, as compared to the 1914–18 war, attributed it in part to the better elimination from front-line service of men of low intelligence.

In general, however, there are few references in medical literature to any relationships between hysteria and intelligence. Adult hysterics behave in so many respects like children that they give the superficial impression of being intellectually childish. The writer has noted how frequently hysterics make use of a lisping, childish intonation, and how readily one gains the impression that they are in all respects childish, only to correct it later on applying intelligence tests.

The immaturity of the hysteric appears only in the affective aspect of the psyche, whereas the cognitive and conative aspects are relatively mature.

When one finds evidence of childish or immature emotional reactions in an adult of average or above-average intelligence, the inference is that such a person is endeavouring to satisfy a wish to remain a child. The characteristic attitude of the hysteric is one of dependence and intolerance of any suspected inattention on the part of a parent substitute. The history of such cases indicates that this dependent attitude is not a sudden regression from a mature attitude to a childish one, but rather is it one which has constantly existed from that age at which it would appear appropriate.

The craving for love may well be ranked with many other habits of childhood, all of which tend to stick more fast than the habits which are formed in the less impressionable adult years, and as such the hysterical emotional foundation is but a mere evidence of a bad upbringing.

Suggestibility.

The following anecdote of Thomas Watson (London, 1857) illustrates that the suggestibility of hysterics was well recognized before Janet's time.

"A lady told me not very long ago that an acquaintance of hers, a member of a family of distinction, had been lying I know not how long on her back; that position having been prescribed to her by some medical man for a presumed disease

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of the spine. She lost all power of using her legs ; but she got quite fat, as indeed, well she might, for her appetite was remarkably sharp, and she lived chiefly upon chicken ; and the number of chickens she devoured was incredible. She lived at some little distance from the town, and at last Sir Benjamin Brodie was sent for to her. Now Sir Benjamin, to use a vulgar phrase, is up to these cases, and he wished to see her try to walk ; but she declared that the attempt to do so would kill her. He was resolute, however, and had her got out of bed ; and in a few days' time she was walking about quite well, and very grateful to him for his judgment and decision. A medical man of less name, or of less determination, would probably have failed."

Eysenck (11) has recently disputed the long held and almost universal belief that hysterics are more than usually suggestible. He carried out tests on a significantly large group of neurotic patients, applying suggestion to them through the impersonal medium of a gramophone record, and measuring the effect by various ingenious mechanical devices. He found that, when subjected to this form of suggestion, hysterics are the least suggestible of all neurotics. His findings, however, appear to have no bearing on suggestibility in the clinician's sense of the word. It is characteristic of the hysteric to behave with emotional calmness in the presence of strangers, and to exhibit tantrums when in the presence of a particular member of the family or a close friend. Similarly the hysteric who fails to show any response when suggestion is applied to him through a record may well respond in ample measure when the same suggestive formula is applied to him by an experimenter in person. Eysenck, in fact, found that the personality of the experimenter does affect the response, and no doubt for that very reason chose a gramophone record as the means of eliminating this variable factor. Apart, however, from the prestige of the clinician in the eyes of the patient, the suggestibility of the latter must also depend on the extent to which the suggestions applied either agree or conflict with his conscious and unconscious wishes. The writer inclines to the view that the amenability of an hysteric to suggestion is proportionate to the degree to which the doctor is capable of making himself appear to the patient as one who is sympathetic but dominant. He must create in the patient a subjective feeling of dependence mixed with respect or awe. He must play upon those sentiments which are developed out of the basic emotions of fear and love.

It is well known that hysterics are very unresponsive, and in fact are negativistic towards suggestion applied by persons in their family circle. This is understandable in that the hysteric constantly taunts those in his domestic circle in his desire to provoke their sympathy, and thereby elicit those constant assurances which are demanded by his insatiable love-craving. The hysteric who fails to elicit sympathetic responses from those near to him will choose mere attention as the next best thing. Of all things he cannot bear to be ignored, and thus will find some solace in stimulating irate attention if he fails to obtain sympathetic attention. It is, furthermore, noteworthy that hysterics possess a remarkable ability to excite the sympathies of strangers, but the hysteric does not attempt to play unduly on those sympathies until such time as he feels he has built up the kind of emotional situation in which he exercises the dominant or controlling role. In the doctor-patient relationship the hysteric feels that he will be shown interest and sympathy without

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his making the efforts which are customary to him in his relations with other people. His relationship with a doctor is, therefore, one calculated to create in him only a subjective feeling of dependence. This feeling of dependence is associated with that age in childhood in which parental direction tends to be accepted tacitly and without question, and thus it is to be expected that the doctor will wield a suggestive power which is denied by the patient to others who may be equally or even more sympathetic than the doctor. The response to medical suggestion will furthermore depend on the degree to which the doctor corresponds to the patient's ideal concept of a parent substitute.

Fits.

Textbooks devote much space to the discussion of the differential diagnosis of hysterical and epileptic fits on a basis of neurological signs, and thus emphasize the physical rather than the psychological differences between the two disorders. With many physicians, even nowadays, the diagnosis of hysteria is reached, more often than not, on a negative rather than a positive basis of signs and symptoms. It is a diagnosis reached by a process of eliminating all positive indications of organic disorder.

This traditional approach to the diagnosis of hysteria, and in particular of hysterical fits, may in part be due to the fact that many hysterics are very similar to epileptics in their temperament. The psychological approach to the differentiation of the two syndromes, therefore, appears to be full of diagnostic pitfalls, and one the pursuit of which often leads to compromise or non-committal diagnoses such as that labelled " hystero-epilepsy."

Much attention has been given to the question as to why hysterics should at times exhibit fits which bear a superficial resemblance to epileptic ones. The similarity of the hysterical fit to coitus and orgasm lends force to the Freudian theory of the sexual motivation of hysteria, but the Freudian theory appears over-stretched when it is suggested that epileptic fits likewise have a sexual significance. It may be more profitable to study the contrary question : why should epileptics bear some symptomatic resemblance to hysterics ?

The writer recalls being warned in student days to be on guard when making the diagnosis of idiopathic epilepsy in a case where fits first appeared in adult life. It was implied that when epilepsy begins in adult as distinct from childhood years, it is usually traceable to some obvious organic cause, such as a cerebral tumour, neuro-syphilis, a toxaemia, etc., but the warning lacked a corollary, since it left unanswered the question, what is the usual age of onset of idiopathic epilepsy ? Many standard textbooks of neurology fail to supply an answer to that question.

Turner's table, quoted by Kinnier Wilson (12), although it lists the age of fit onset of 1,000 cases of epilepsy, does not supply a satisfactory answer, since it does not exclude non-idiopathic epileptics. However, according to Turner, the age of puberty is the time of choice for the onset of epilepsy (viz. 11 to 14 years), and the mean age of onset for his 1,000 cases was 14·8 years.

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We frequently note that epileptics are similar to hysterics in temperament, although they differ from them in character and in total personality.*

The writer, however, has gained the clinical impression that those epileptics in whom the fits commenced not later than the age of puberty form the group which shares the same temperamental stigmata as the hysteric, viz. the traits of dependence, sympathy-craving, and emotional unrestraint. These traits are rarely seen in the epileptic whose fits commenced in adult years. The temperamental relationship between epilepsy and hysteria may, therefore, be simplified if one is prepared to accept the view that such temperamental traits are characteristic of hysteria and merely incidental to epilepsy. The epileptic child is frequently fussed over, protected, mollycoddled; over-loved, and in general subjected to all those environmental factors most conducive to the development of a sense of dependence, and the hysterical trait of love-craving, which as readily result from the excessive show of parental love as they do from the opposite factor of parental love denial.

Hysterical Traits.

Sadler (13) aptly summarizes the features of the hysterical personality in one sentence—" Hysteria, at least in many cases, seems to be a persistence in adult life of that altogether normal desire of the child to show off, to do stunts, to attract attention, and to create comment about his performance." One finds much wordy debate in literature about the cause of certain dissociation phenomena, such as somnambulism, for example. But somnambulism is principally a disorder of childhood, and is popularly regarded as a common and not serious disorder which is grown out of in due course, and after all, the layman only regards somnambulism as a really abnormal thing when it persists into adult life. All such hysterical phenomena savour of being mere evidence of an arrested emotional development. Even in the rare cases of dual or multiple personality we find almost invariably that one "personality' is that of a child.

It does not add to or clarify one's concept of the hysterical personality to draw up a list of personality traits, such as lack of emotional inhibition, tendency to convert mental into physical suffering, day-dreaming, exhibitionism, sexual maladjustment, and self-engrossment. Admittedly a host of traits, in addition to these examples, are known to be hysterical characteristics, but all such traits are simple offshoots from the one fundamental trait of love-craving. The inborn or inherited personality traits of the individual modify such acquired traits as that of love-craving, and in all probability that is why one hysteric will exhibit his love-craving tendency most particularly in the subsidiary trait of exhibitionism, and another will exhibit it principally in the shape of uncontrolled emotions.

If, for the sake of argument, we presume that the pair of opposite qualities, introversion-extraversion and impetuosity-deliberateness, are inborn traits,

* The writer uses these terms in the following sense :—
1. Temperament: The habitual emotional tendency of an individual.
2. Character: The individual's way of behaving when faced with moral issues.
3. Personality: The distinguishing qualities of an individual as a whole.

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we may then consider their probable modifying effect on the acquired trait of love-craving. The introvert, that is the person combining such traits as idealism and the asocial attitude which arises from lack of sentimental rapport with the common run of humanity, will most surely translate a love-craving trait into the exhibitionist subsidiary trait, which is aimed at attracting the attention of the masses rather than that of individuals. Again, if we presume that extraverts be divided into the fundamental sub-types of impetuous extraverts and deliberate extraverts, the impetuous extravert will surely form that class of hysteric who is principally recognizable by his uncontrolled emotions, and the deliberate extravert will form the class of hysteric recognizable by his effort to sublimate the love-craving trait in the pursuit of altruistic humanitarian vocations.

Success and Failure in Sublimation.

Failure on the part of the hysterical personality to sublimate his love-craving shows itself principally in the form of marital incompatibility. The marital difficulties of the hysteric appear to emanate from three factors. Firstly, the hysteric so frequently has a pressing desire to escape, by any means, from an unhappy parental home that he or she will marry too hastily, and by marrying at too youthful and unsophisticated an age will frequently choose an unsuitable partner. Secondly, the insatiable love-craving trait causes the hysterical personality to seek constant assurances of fidelity and love, and to make demands of the marital partner which begin by causing irritation and soon become intolerable. Thirdly, the hysterical personality is very often sexually frigid. The sexual frigidity of hysterics is readily understandable in that they crave the type of love which is shown to a child, that is, a kind of love relationship which is all-take-and-no-give, and not an adult form of love, or the mating type of love which demands reciprocity of feeling and action in its culmination through the sexual act. In general it may be said that the hysterical personality does not seek a mate, but marries rather a parent substitute, and the success of such a marriage therefore depends largely on the willingness of the non-hysterical partner to play the role of a parent substitute.

Mrs. U. H—, aged 20, was admitted to hospital having taken an overdose of phenobarbitone tablets which had been prescribed for her husband, a sufferer from nervous dyspepsia. The patient was above average in intelligence, and showed a clear understanding of her temperamental inadequacies. Since she married at the age of 19 a man five years older than herself she had continually created stormy scenes at home by reason of her insatiable desire to stimulate her husband, a stolid and undemonstrative man, into daily dramatic exhibitions of his love and devotion towards her. She ostentatiously flirted with other men, but always in her own home, and with no intention other than that of her morbid desire to see the effect of it upon her husband. She stated that she had been utterly spoiled by devoted parents all her life, and that prior to her marriage she had on several occasions staged suicidal attempts with the sole object of enjoying the subsequent fuss and tender concern shown to her by her parents.

The hysterical personality may, however, and usually does, direct his or her love-craving tendency into socially useful and acceptable channels. Successful sublimation most commonly takes one of the following forms:

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(*a*) Skill in handling small children.

(*b*) The pursuit of humanitarian vocations such as missionary work, nursing, and social welfare.

(*c*) Histrionic ability.

Hysterical personalities certainly take a special interest in children, and have an aptitude for any kind of work which involves their being in close personal contact with children. It is, in fact, very rare to find a hysteric who shows a dislike of children's company. In all probability the company or care of small children attracts the hysterical personality because such a person, having an arrested emotional development, is largely free from the emotional inhibitions of a more mature personality, and can in a quick and natural way find emotional rapport with a child. Anyway, whatever may be the explanation of this hysterical aptitude, the writer has noted, when giving vocational advice to young adult hysterics, that such patients show a particular willingness to discuss the features of various jobs involving the care of children.

Miss O. B—, aged 21, suffered from frequent noisy attacks of weeping. She had an excellent school record of academic attainments, but despite her high intelligence was very irresponsible in behaviour, having twice caused herself to have an abortion. Her mother had always been fully employed outside her home, and had always shown scant affection towards the patient. Miss B— had a burning desire to undertake training as a children's nurse, and was convinced that this vocation would satisfy the emotional void in her life.

Miss A. M—, aged 16, suffered from occasional trance-like states in which she had terrifying visions and heard mysterious voices. She was the only child of a chronically neurotic mother who suffered from a duodenal ulcer, and who was self-engrossed to the extent of never having shown any affection towards her daughter. Miss M—'s only vocational desire was that she should become a nanny.

There furthermore appears to be little doubt that the hysterical personality is particularly attracted by the sort of occupations which appear to offer the novice the opportunity of playing parts on the stage of life akin to those, say, of Florence Nightingale, Mahatma Ghandi, and Karl Marx. We therefore find a high proportion of hysterical personalities in the medical, nursing and ancillary medical professions, missionary work, social welfare, and left-wing politics. The novice seeking a vocation, if he has the hysterical trait of love-craving, is apt to build a phantasy around such vocations, and to picture himself or herself as the bountiful provider of a worshipping and dependent humanity.

Mrs. E. C—, aged 57, had for 8 years suffered from severe pains in her hips and spine, for which exhaustive examinations failed to reveal any physical cause. She believed her symptoms had been caused through overwork, when some nine years previously, during a time of financial stress, she had gone out to work in addition to attending to duties in her own home. She volunteered the information that she liked " queer jobs," and had only undertaken work such as taking care of the aged, the blind and the deaf. She was the eldest of a family of six, all of whom, with the exception of her youngest sister and herself, had died in infancy. As a child she was unhappy because her mother had never taken any interest in her. On leaving school she had wished to be a doctor but her father could not afford her education, and she was also frustrated in attaining her second vocational choice of becoming a nurse.

Mr. J. M.—, aged 36, had become so intolerant of orders, and so subject to violent outbursts of rage, that he could not hold a job. For some months he had

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also suffered phases in which he lost his memory. He expressed doubts about his wisdom in having married since he had always had a hankering desire to be a priest and because he " wanted the kind of job in which he could help people who are in trouble." His wife said he was a soft-hearted and attentive man, but that he was utterly dependent on her in all matters requiring decisions. He was removed from an orphanage by a grandmother, who adopted him; he had lived alone with her from an early age until manhood, and had married immediately after her death.

The job is attractive to the hysterical person in proportion to the degree to which he anticipates that it will get him emotionally involved with other people. The vocational phantasy of the hysterical person is no idle or impractical phantasy. Hysterical people are generally of good intelligence, and the combination of that factor with interest in the job makes for success in it.

Apart from their tendency to stir up dramatic situations in the home, hysterical people generally have a well-developed histrionic ability. The contrary may also well be true, that to be a great actor one must possess a hysterical tendency, since, if one associates histrionic ability with marital difficulty, the large number of divorces amongst film stars becomes more readily understood.

Love Deprivation Situations.

The sort of domestic situations causing a child to crave parental love may be conveniently grouped as follows :

(*a*) Death of a parent.
(*b*) Parental strife.
(*c*) The chronically sick parent.
(*d*) Prolonged illness of the child.
(*e*) Separation of child from parents.
(*f*) The uninterested parent.

Death of the mother is, as a general rule, a more serious catastrophe from a child's viewpoint than is death of the father. Where the family is large, and the eldest female child is old enough to fill the role of a mother substitute, the younger children are thereby somewhat protected from emotional trauma, and it is, on the whole, unusual for the younger children of a large family to develop the hysterical personality as the result of bereavement. When lacking a mother substitute for his children, the bereaved father commonly hands over the care of a child to the grandparents or other such relatives. Stepmother difficulties arise, not so much in respect of any lack of affection on the part of the stepmother for the child, but rather because of her attempting to play the mother role at too long an interval after the death of the actual mother, by which time the child has accepted some other female relative as a mother substitute.

Parental strife is a particularly strong factor in creating hysterical tendencies, especially when the child feels obliged to take the part of the " good " against the " bad " parent. One commonly obtains this kind of story from a

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hysterical patient: "My father was a drunkard and used to beat my mother. I was terrified of him; I was sorry for my mother and used to take her part. Now that I look back on it with mature reason, however, I realize that my father wasn't really so bad as mother used to make us children believe, and I now realize it was largely her fault as much as his, and she probably drove him to drink." In such situations one finds very often that the mother is of hysterical personality, and that the child's hysterical tendency not only emanates from over-dependence on mother's protection from the terrifying father, but also from a process of identification with mother, and a consequent mimicry of her emotional unbalance.

The chronically ill parent tends to excite jealousy on the part of the child, who naturally resents the unfair advantage of the invalid in competing for the attention, and therefore the affection, of the other parent. The child soon learns the power behind the weapon of illness, and frequently in later life reproduces the parental illness in unconscious mimicry. Freud's case "Dora" gives an excellent portrayal of this factor in the production of a hysterical personality.

Any prolonged illness, especially one necessitating the child being nursed at home, tends to create hysterical tendencies in the child, although the manner in which it does so is rather more obscure than that of the other environmental factors which have already been discussed. From one point of view it would seem an unexpected thing that sickness should cause a child to crave love, since sickness can but add to the parental attention which is normally shown towards the child. In fact, however, a prolonged illness tends to increase the child's feeling of dependence, and the greater degree of sympathetic attention and allowance for naughtiness shown to the sick child come to be regarded by the child as normal, and therefore expected, attitudes. The impersonal atmosphere of hospital, especially that of a children's ward, is in general a far more healthy one for the sick child than its own home. In hospital the sick child is unlikely to feel singled out or made the focus of attention, and when the child returns home the parents have the advantage of resuming normal emotional relationships with the child, more or less at the point where they were interrupted, and of regarding the illness and hospitalization period as matters which do not concern or affect the ordinary parent-child attitudes. On the other hand, the sick child who is nursed through a long illness at home, and especially if nursed by its mother, is in a far less favourable position than the child who is treated in hospital, since on the restoration of health, not only the child, but also the mother or even both parents, have to readjust themselves towards resuming normal attitudes and domestic routine.

It would be superfluous to comment in any detail on the effects of the war-time evacuation of children from cities, since the psychological disasters associated with it are only too well known. It is, however, difficult to assess the degree to which the war-time evacuation factor in itself has affected the general child health of the nation, since so many other factors operated simultaneously, all of which tended to upset the average child's sense of security. The separation of parents, for example, gave rise to many cases of marital infidelity, so that many children returned from evacuation to already broken

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homes, and ones which may have caused them to yearn for the affection of their foster parents of evacuation days. One may at times be misled into accepting a "separation from parents" situation as being the initial factor in the causation of child hysteria, when the sending away of a child from its parental home may in actual fact be a consequence of parental incompetence or failure, and a mere compensatory step to overcome some already well-developed pathological child-parent relationship.

Want of interest in the child on the part of a parent is, of course, a difficult factor to track down if the examiner places overmuch reliance on the statements of parents. The subjective attitude of the child to its parents is obviously more important than the attitude of the parents judged objectively. Frequently, in taking the history of a case from various sources, one will find evidence, say, that a mother has lavished affection on her daughter, but on questioning the daughter one finds that all the outward show of maternal affection was nullified by the mother's unconscious disclosure to the daughter that she would have preferred a son.

Some Cases from Medical Literature.

Professor Janet (14) was of the opinion that the desire to be the focus of attention or love, although commonly seen in hysterics, is by no means a characteristic feature of hysteria. It is noteworthy, however, that most of Janet's case descriptions begin at the point where hysterical symptoms were first manifested, and it is thus evident that he devoted more attention to the description of hysterical symptoms than to the kind of personality traits which are the forerunner of such symptoms. In fact, whenever Janet remarked on the antecedents of a case of hysteria, he invariably described a situation of a type which is conducive to the development of love-craving. His famous case, Irene, has been much quoted by Hart (15), McDougall (16) and others, but these writers, as well as Janet himself, seemingly attached little significance to the fact that Irene's father was a drunkard, and that she experienced the disastrous effects of a disrupted home long before her hysterical symptoms made their first appearance.

Freud (17) gave a detailed account of his analysis of an hysterical girl to whom he attaches the pseudonym "Dora." The girl had no affection for her mother, but was much attached to her father, a chronic invalid, whose symptoms she mimicked in her hysterical illness. Freud described the features of her domestic environment in a manner suggesting that he did so with a view to illustrating her neurotic heredity, rather than the part which maternal love-deprivation played in conditioning her towards all those very sexual maladjustments to which he attached the major importance in tracing the underlying mechanism of her hysterical symptoms. Thus in his description of the case, Freud appears not to touch upon the core of the problem at all.

In the writer's experience, whenever one meets with a case of a girl who shows an obvious emotional attachment to her father in preference to her mother, it is equally obvious that the mother has been lacking in ordinary parental affection. The abundant case evidence supporting this point suggests that father-fixation in the case of girls is not a normal phase of development

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of the sexual instinct, but a misdirection of the child's ordinary desire to be loved from its natural focal point on to the next best thing.

To return to the case of Dora, Freud found in her fondness for the children of "Mr. K." evidence of her unconscious wish to be loved by "Mr. K." In this respect Freud made no allowance for the aptitude frequently shown by adult hysterics for earning the love and respect of children, their liking for small children, and their ability to maintain an emotionally stable attitude towards children in contrast to their stormy emotional attitudes towards adults.

Although Morton Prince (18) devoted almost an entire book to the discussion of his remarkable case of multiple personality, "Sally Beauchamp," we find that he merely makes a passing reference to the following features of the case-history, which, in fact, are worthy of greater attention:

"Sally's" father was a man of violent temper, and her parents were unhappily married. Her mother exhibited a great dislike of her, for no apparent reason other than that of her facial resemblance to her father. Miss Beauchamp felt she was ignored by her mother, except on occasions of a reprimand, but nevertheless she idealized her mother, bestowing on her almost morbid affection, believing that the fault was her own, and that her mother's lack of affection was due to her own imperfections. When she was thirteen her mother died and, during the three years following, she lived in great unhappiness with her father, until, at the age of sixteen, she ran away from home.

Having regard, furthermore, to the writer's foregoing comments on hysterical vocations, there may be another significance in Dr. Prince's footnote—"She tried three times to do professional nursing and broke down."

William McDougall (16) likewise ignores love-deprivation factors in his description of hysterics. Of the many cases which he describes in his *Outline of Abnormal Psychology*, he refers to features of the early history in only two of them, namely, Dr. Morton Prince's case Sally Beauchamp, and Dr. Walter Prince's case Doris Fischer. In regard to Doris he states—"She was the youngest child of poor parents. Her drunken father, in the course of a quarrel with his wife, threw the child, then three years of age, violently upon the floor."

As yet a further example of the scant attention which psychiatrists have given to the significance of environmental factors in the causation of a love-craving habit, and the causative influence of that trait in hysteria, we may note that, of the eleven cases of hysteria described by Henderson and Gillespie in their *Textbook of Psychiatry* (19), reference is made to features of the early history in only one case (case 73). That reference is well worthy of quotation: "He was always very nervous of his father, who was very severe in his punishments. In his boyhood the patient was thrashed, sometimes every day for a week, put on dry bread and water and deprived of his clothes. While at school (from 5 to 15 years) the father made his son work in the garden before school hours from 4.30 a.m."

So it is with any other case descriptions of hysteria in medical literature. Where an author describes the antecedents of a case of hysteria in any detail, we generally find he does so with a view to emphasizing points indicative of neuropathic heredity, but invariably, given a detailed history of a case of

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hysteria, we find that the hysterical symptoms were preceded by experiences of a type calculated to create in the patient the feeling of being spurned or rejected by those whose love he would most have valued.

Conclusion.

The clinical syndrome which we call hysteria, and which is characterized by various dissociative phenomena, requires for its production a remote as well as an immediate factor. The immediate factor is an anxiety-provoking situation; the remote factor is the disposition which we call the hysterical personality. The hysterical personality is that having the one characteristic and fundamental trait of love-craving which manifests itself in various subsidiary traits such as exhibitionism, sexual frigidity or excess, tantrums, desire for "emotional" occupations, hypochondriasis, and so on. The love-craving trait does not appear to depend on congenital factors, but rather is it an emotional habit acquired by persons who are subjected to abnormal emotional stimuli during the impressionable years of childhood. The particular set of environmental circumstances which cause a person to crave love, in turn colour or shape the manner in which that trait subsequently shows itself. Thus, for example, the girl who is rejected by her mother, but who is fussed over by an indulgent father, may later marry a man much older than herself, and make excessive demands upon his show of affection whilst at the same time being sexually frigid towards him. Again, the boy or girl who has been treated by both parents with harshness or coldness may subsequently seek emotional satisfaction in leading the life of a libertine.

Love-craving is only one of the several dispositions which may be acquired by a child through the effect of adverse environmental factors. The hysterical or love-craving trait is that particularly influencing the affective aspect of the psyche, whereas the obsessional or guilty-conscience trait concerns more the conative aspect, and the inferiority or self-debunking trait is mainly a cognitive maladaptation.

The same anxiety-provoking situation may in one individual cause a state of pure anxiety leading to exhaustion, in another it may be translated into symptoms more worthy of the title obsessional neurosis, and in yet another it may alternately manifest itself in the shape of hysteria. Thus, the particular neurotic syndrome which results from anxiety is determined, not by the form of anxiety itself, but on the dispositions acquired by the individual in the course of his development.

When we ascribe the hysterical personality to an individual we do so in a quantitative, and not a qualitative manner, because the desire to be loved is altogether a normal thing.

> Lieben und geliebt zu werden
> Ist das höchste Glück auf Erden.

An individual may have a hysterical personality, and yet exhibit a form of neurosis which is mainly obsessional because of having a yet more strongly developed obsessional than hysterical trait in his personality.

The hysterical trait is probably the most common and widespread of all

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acquired personality traits. Its clinical recognition is of prime importance in questions of vocational guidance and the rehabilitation of convalescent psychotic or neurotic patients.

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AN INTERPRETATION OF PLAY THERAPY BY THE PSYCHO-SOMATIC THEORY OF FAMILY SEXUALITY.*

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I PROPOSE to explain the application to play therapy of a theory of family sexuality (Turner, 1947), upon which I have been working for some time.

When children are referred to me I see them individually and ask them to tell me, usually by their play (Lowenfeld, 1935), what real or imaginary thing could have caused their symptoms. I then follow the technique of Melanie Klein (1932) in that I straightway give an interpretation.

Like Freud and those who have followed him I see a sexual significance in the symptoms, and when I have not done so I have often found later that I have been wrong. You will be familiar with the mechanisms of the mind which he and others have described, and so I am not going to stress them in this paper, although I endeavour constantly to be alive to their value. The theory which I am going to give has the same background with which you are familiar, but does, I believe, carry our knowledge a step further. If you do not comprehend it at once I hope that it will become clearer to you as an interpretation of play therapy when I give you illustrative cases. The theory is this:

Animals were men's primitive environment, and killing was the expression of the relationship of human beings to these animals. We killed smaller animals for food, and we hoped to avoid the larger animals which desired to make food of us. For this situation there was prepared for us through the ages an inheritance of appropriate pugnacious instincts, and for this situation of the jungle our primitive parents trained, developed and sharpened our instinctual inheritance. It is my theory that suckling begins this training of the instincts. Man does not live by bread alone, nor babies just by milk; and it is my theory that the emotions of suckling portray the killing and being killed by animals for which the young are being nurtured. In suckling, therefore, the baby learns to kill the inferior species of animal portrayed for it by the mother. In suckling also the baby learns to fear death from the superior species of animal portrayed also for the baby by the mother. Such is the mother's duty primitively, to identify herself with the animals, with which the young must become familiar in order to live.

In coitus the male and the female demonstrate, the one to the other, their duties. In the courtship of the sexual act he portrays the hunting of the

* Read before the Midland Child Guidance Group at the Francis Dixon Lodge Child Guidance Clinic, Leicester, on 19 July, 1947.

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inferior species with which she is identified. In coitus he first portrays the killing of the inferior species, and then at the orgasm he portrays the yielding of his life to the superior species of animal, again played by the female. The first half of the act demonstrates what is good for the family, namely the death of the inferior species, which is eaten for food: the second half of the act demonstrates the bad, namely the risk of death from a superior species, a risk which the male must take when out hunting for the family.

You will notice that the theory gives a normal significance for the animal figures and ambivalent emotions which are such a constant feature of the play of children, both in and outside of the clinical room.

In the light of this theory, which says that mothers are identified with animals, it is not surprising that children should love pet animals, and love stories about animals, especially when the animals behave and dress like human beings. Nor, in view of the knowledge of the good and evil of violent emotions, which the theory states is implicit in sexuality, is it surprising that children show such ambivalence, when in their mutual play they often pretend to kill or be killed, and arrange amongst themselves in the most good-natured way who should be dead.

In suckling it is believed the child is taught these emotions with love. In weaning it is taught again with love to forget these things, for civilization demands sublimation. In the growing biological preparedness for coitus the same primitive emotions revive, to be let loose in coitus and suckling but otherwise to continue sublimated. Succeeding generations of human life therefore take on this sequence—in suckling is instruction in primitive killing; from this one is weaned to continue with civilized instruction; in marriage is the return to primitive emotions of killing and the birth of the next generation and a repetition of this cycle.

Such was the interpretation I put upon this sand tray (Fig. 1), done by a boy, A. T—, 8·7 years, I.Q. 135, who said the wild horses were being driven to the enclosure to be trained and then ridden away. The picture is like a baby growing up I told him: at the breast (the hills) he learns of wild animals; then he is trained in peaceful pursuits. The horses are now tame, like his civilized mother. But the primitive emotions are still there in the horses I had to point out to him and are still in you—you still really know how to fight if it is really necessary I reminded him, for he was a little Lord Fontleroy who was brought to me for crying frequently, and who could not take his place in the rough and tumble with other boys who imposed on him. He said that in a film he saw the trained animals were set free to be wild again: I agreed with him that in growing up to marriage that was again the case if fathers and mothers were to have children.

You will notice that in this sand tray the mother is represented on the left in two ways. There is in the hills the anatomical symbol of her breasts. There is also in the wild horses the emotional symbol of her motherhood, for, according to the psychosomatic theory, which I have given you, it is the mother's primitive duty to symbolize the animals which are important to the young. Though both aspects are important, you are already familiar with the first or anatomical symbolism, so I shall be emphasizing the meaning of the animal identification in this paper. Similarly you will be already familiar with the ambivalence explained by jealousy in the important oedipus complex,

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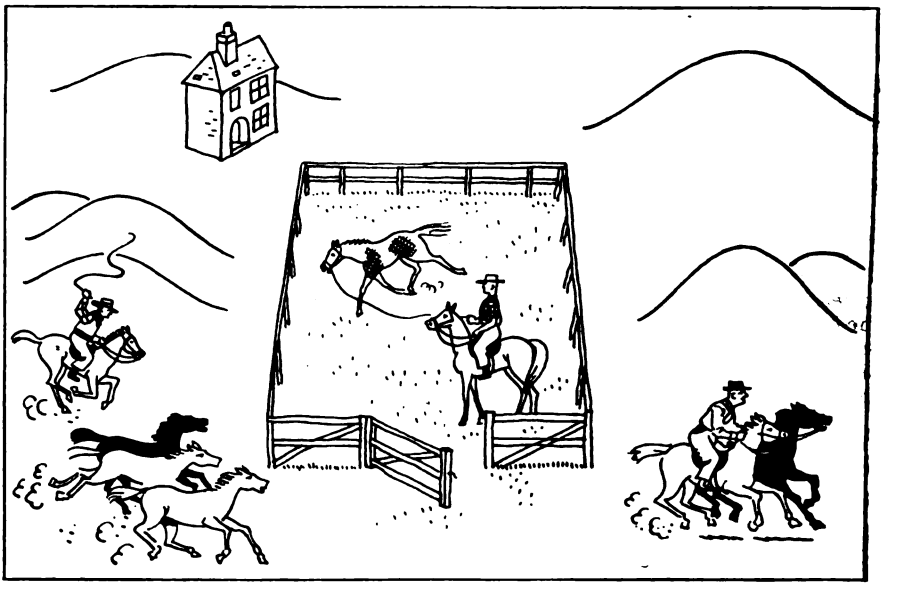

FIG. 1.

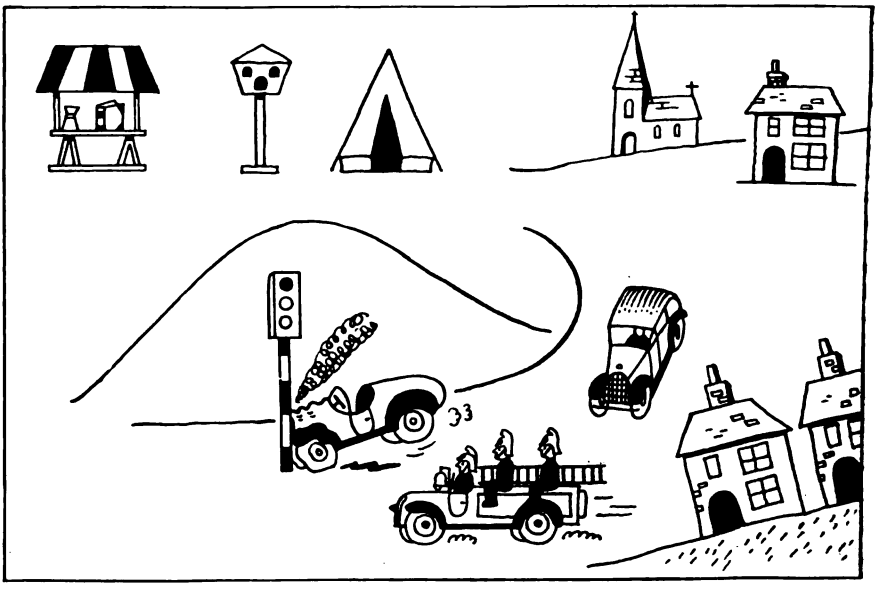

FIG. 2.

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and so in this paper I shall lay the emphasis on the aggressive quality inherent normally in sexual love, even apart from sexual jealousy.

In most children who come for treatment the interpretation of their play is possible by the theory I have given you. Hence I shall refer to relevant aspects of several cases rather than tell you the whole story of one or two cases only. I should now like to show you pictures of two sand trays which, like the last sand tray, give the broad panorama of the field which I wish to cover in this paper.

They are by a boy, L. H—, who was brought to me on account of an inability to read, although he was otherwise a bright boy of 8½, I.Q. 100–125. The boy is in the car (Fig. 2), which has crashed into lights at danger and is on fire. He thought, he said, that there was a road on the hill side of the traffic lights, leading round to his sister in camp, where there was an aviary and a milk stall on which he insisted there was a book. My interpretation was that he was going to his sister and has got into trouble, and so has been brought to me. "Yes," he said, very pleased at my intelligence. His sister, I continued, could provide him with milk and a book—which stands for women—like his mother, who could give him milk and wisdom as a baby and now wishes him to get wisdom and learning from books. At the breast, I said, he learnt jungle wisdom, hence the aviary, but now he must learn civilized wisdom, and that will necessitate learning to read from the book. This scene was depicted on his first and second trays, and you will observe that I followed the practice of giving early interpretation. Much as I tried, however, to get off to a good start with interpretation I was yet too slow, for it took me eight more sessions before I tumbled to it that he was trying to tell me that the reason why he had not developed from what I have called learning jungle wisdom at the breast to putting the same emotions into learning from a book was because he was guilty about his sexual emotions—because from the age of 4 to 6 years, as he then told me, he had practised incest with his sister—yet he had told me at the very beginning in his sand tray (which was to explain his symptoms) that his car had crashed and burst into flames when on the way to his sister!

Before I knew why his emotions could not develop to reading he was giving me sand trays of coital significance such as this one (Fig. 3).

A fox is chasing chickens to kill them in an enclosed wood. Outside the wood is a desert containing wild animals hunting each other. A crocodile is about to enter a ditch containing a fish and two swans.

My interpretation was that the ringed circular wood represented the mother's vagina where the knowledge exists of animals who kill each other in real life outside the wood. Her vagina is adjacent also—the penis is about to enter. He knows as much as he needs about all this, and before he can do as his father does and marry and have children he must gain other knowledge, i.e. from books. He had been reported to me in the first place as being very restless at home and continually worrying his sister. I now told him that he need not worry his sister so much, that knowledge for the present was to be had by reading as they taught him in school.

I have already said it became clear that it was guilt for incest with his sister when he was 4 to 6 years of age which was obstructing the orderly development of his emotions and his learning, and I am pleased to be able to say that he was reading satisfactorily and behaving well after 14 interviews in 5 months. I wish to emphasize the manner in which he used animals and hunting and an accident to a car in order to draw my attention to his sexual difficulty, and I also wish to emphasize the manner in which I interpreted this animal identification and ambivalence.

I propose to choose sand trays which illustrate the various aspects of the theory I have put before you, and the use to which the theory can be put in the

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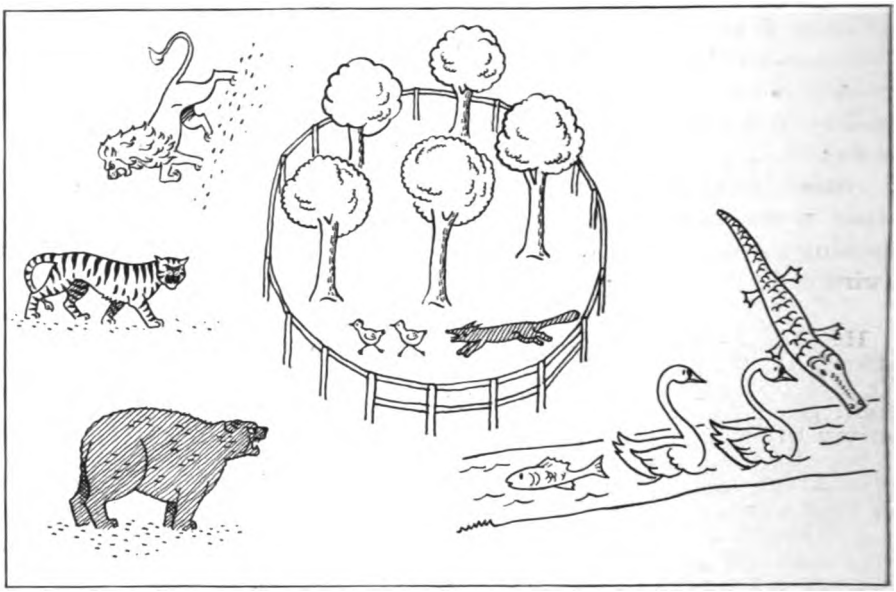

FIG. 3.

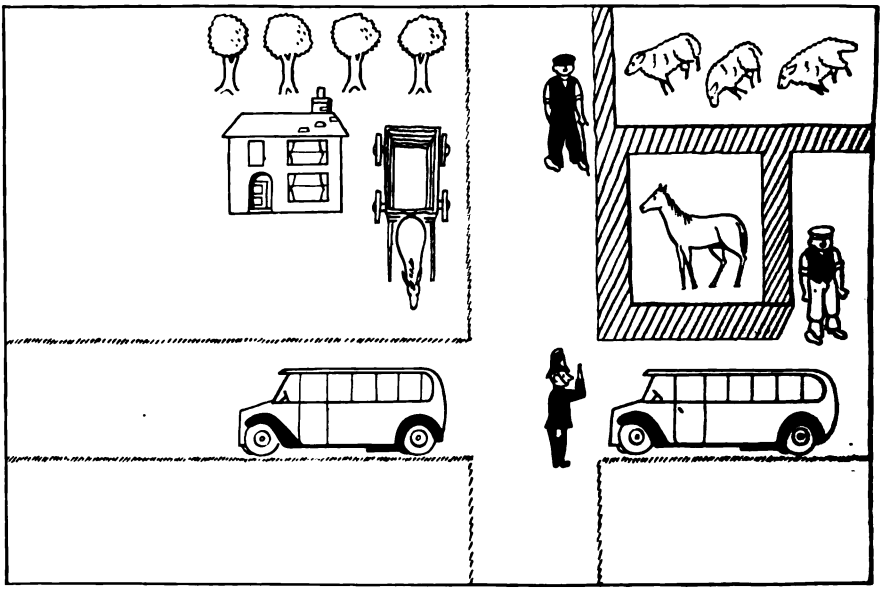

FIG. 4.

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interpretation of play therapy. The aspects chosen are (1) animal identification; (2) the aggressive and fearful quality of sexual feeling; (3) the ambivalence of this aggression and fear with love and loyalty, and then the subject will be gone over in more detail by considering, (4) the goodness of killing the smaller species, and (5) the badness of being killed by the larger species of animal.

Animal identification.—The primitive sexual female role of animal identification is the symbolization of the animal environment, for the purpose of teaching the young, and for charging her mate, to address themselves to the environment.

Here is a picture (Fig. 4) of a sand tray which I interpreted by animal identification. The scene was made at the first sand tray of a boy, O. S—, 10·9 years, I.Q. 136, who was referred to me for stealing. I asked him to do a scene which would give an excuse for stealing (I often use this technique in an attempt to shorten treatment by drawing the child's attention frankly to the matter which we hope to correct, and asking for a sand tray scene which gives a real or imaginary explanation of the symptoms). He said that he was the tramp who walks along the road, passes a farm and wants to steal milk.

The history of the boy was that his mother, due to home difficulties, had placed him with guardians at the age of 3 months, but had kept in touch with him until her death when he was 9 years old. In the guardians' house were three women, his wife, sister and grown-up daughter, until the wife and sister died and the grown-up daughter developed hysterical paralysis. It is evident from the history that emotional deprivation was probably the cause of the stealing.

My interpretation of his play was that the boy wants his mother for her milk and for her love; the mother is the horse in the field; there is a fence around it; it is always so for all boys when suckling is finished; it is the same for all boys even if their mothers do not die. His mother went out of his life but there were three other women (the three sheep), and there is a fence around them. They also are inaccessible for milk, but he is, like all other boys, lovable nevertheless by the womenfolk, and he need not be shaken out of that conviction by the deaths or illness of the three women. Let him bide his time was my advice, for when grown up the empty cart and horse, unfenced, awaits him in marriage, when he has learnt of the world through schooling, etc. It appeared to me that he could have survived the present deprivation stress had it not unconsciously stirred the normal deprivation stress of weaning. I tried to correct his attitude to this, and was led to the point of view I took with him by the sight of the single fenced animal and the three fenced animals, portrayed by a boy who had suffered deprivation of one mother and three other women.

My next case is that of an extremely shy girl, D. I—, 11·6 years. She appeared to me to be a case of incipient schizophrenia. She was almost mute with me and all other adults, and had been so for some years, though with other children she was restless and mischievous. The parental history was a most involved one of bigamy and separation, and she had since been with foster-mothers and was, at the time I saw her, in an institutional home. Three years before she was brought to see me she had been enticed into the house of a neighbouring man to "play doctors." On one occasion something happened there which frightened this little girl and she ran home, but would not say what had happened; however, she persisted in undesirable play with other children, was seen with a younger boy attempting

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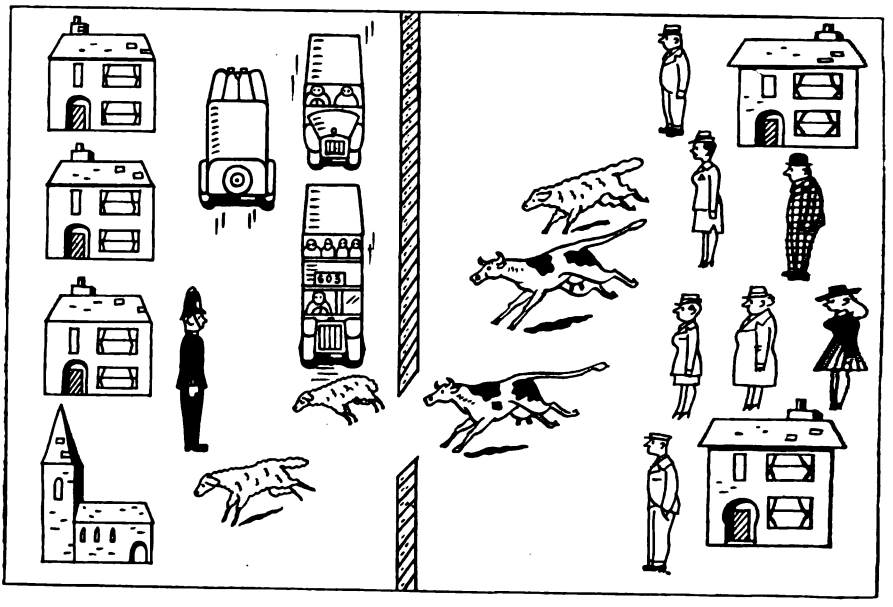

FIG. 5.

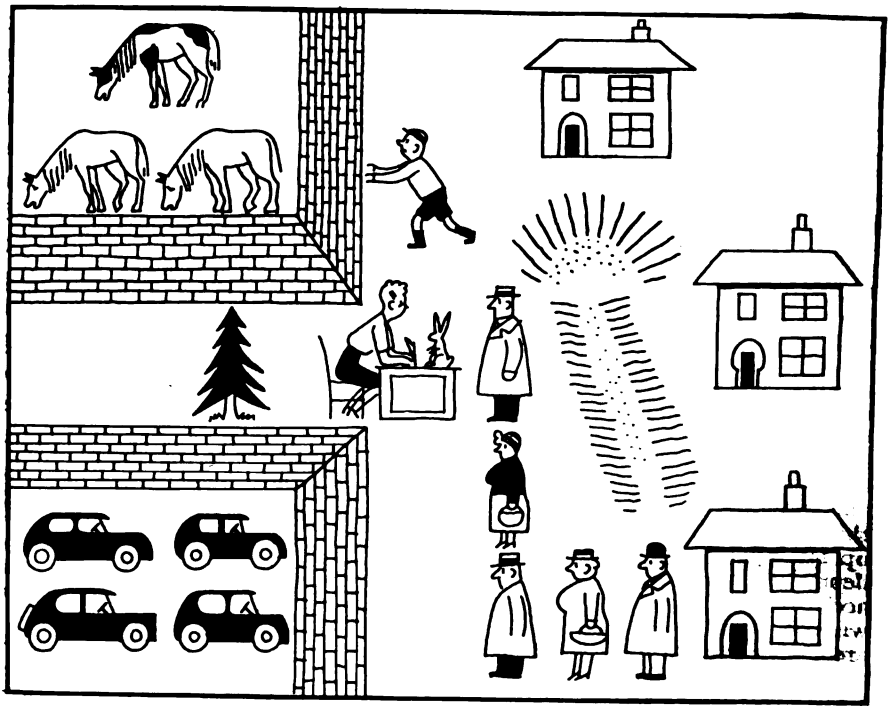

FIG. 6.

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sexual intercourse in a field, was often soliciting or threatening other children in the neighbourhood for the same thing, and neighbours naturally forbade their children to play with her. Whether she thought she was unjustly stopped from innocent fun I do not know, for as I said, she was practically mute. She was also unwilling to play, and after 10 sessions of apparent futility I gave the treatment up for the time being. However, the scene here depicted (Fig. 5) was interpreted in terms of animal identification, and afforded about the only instance of rapport which I had with her. She would not proceed, but stood stuporosely unless I handed her a toy model on the tray: if she wanted to use it she put it in the sand, if she did not want it she just stood with it in her hand until I took it and gave her another.

On the left is a street scene separated by a fence from a country scene. She would make no comment nor identify anybody. I took away three pieces of fencing and asked what would happen. She put some of the animals through the gap; a sheep was placed on its side in front of a bus—she said it had been knocked down but not killed. My interpretation was that the sheep was herself and the men and boys did not really "kill her" (i.e. have intercourse), but they were only messing about with her. To my surprise she looked up intelligently and said "Yes." Perhaps she was telling me that she was not as bad as she was painted; I do not know, for she again became inaccessible, yet I think it was significant that she showed a flicker of response when I likened her, in her sexual misbehaviour, to a sheep.

The aggressive and fearful quality of sexual feeling.—We now come to the closer study of the subject of sex being associated with ideas of killing and death.

A boy, D. Z—, aged 14, told me that he remembered that when, as a boy of 4 years, he saw his dead father in the coffin, he kept saying (3 times). "Take my father out of the wedding." His memory was that at 4 years of age when this took place he thought that his father was alive in the coffin and was going away to marry someone else. He believed his father was dead "when he had gone," but before that he had associated death with marriage.

My next case is more frankly sexual, for it was in the history of this boy, O. H—, aged 10 years, I.Q. 111, that he liked looking through bedroom keyholes at girls. He was referred for stealing, truanting and soiling. He was an adopted illegitimate child, who doubted whether he had ever been loved or that he had ever loved anyone. He was a cheerful rogue, and his play often showed ideas of sex combined with aggression. Besides himself his play usually centred round his mother, his father—whom he had not known—and a man he called his father's friend. One day these three characters were absent, but in their place was a car crash—he was standing on an upturned bus, and two other cars were close by. He confirmed what I took to be a coital theme, relating to himself his mother and the two other men by placing two tanks one on top of the other and saying that he had seen a married couple on the pictures continually "on top of each other." I therefore gave my interpretation of the car crash and himself on the upturned bus in terms of sex and its aggression. The next week I asked him to do a sand tray scene of a situation that would make him steal (Fig. 6). Twenty-one people were queuing up to pay threepence to view horses or cars, which were segregated behind high walls "that cannot be seen over." He placed himself outside the enclosure for horses and said he was going to steal one. I interpreted to him that horses are women, mothers, one of whom he has wanted, and that the cars are men. He proceeded to say that the women in the queue want a car and the men a horse, and each being mated up make trial of their purchases and have accidents and are left killed in the depression or ditch, and are all buried, except the boy and his horse, which avoid accident and death. It appeared to me that he had idolized love for himself and wished to avoid the aggression of love. I interpreted therefore that the dead are not really dead but in bed together, and will be all right to-morrow—that it always feels that way. He was very pleased with this and continued to play. I asked him, "What would your father say if he found you with that horse?" to which he answered, "I would not let him—I would run away and hide and get up in the night and come back." He was, as I have told you, a cheerful rogue.

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I assured him that other boys of his age, even if loved and cared for by their own parents, cannot share in the fun or the associated duties he has depicted until they are grown up. He has not got to steal to be equal to them.

He was seen on 17 occasions, and he had been free from symptoms for some weeks before treatment was stopped.

An important stage in his treatment had been the interpretation of aggression in terms of sexuality.

A girl, I. G—, aged 13 years, I.Q. 122, had been referred to me after she had been brought before the Juvenile Court as being beyond parental control. It was the parental behaviour, however, which was primarily at fault, by giving the girl a false attitude to the normal association of sex and aggression. She was conceived out of wedlock and her parents would not otherwise have married. Her mother soon found out that her husband was an epileptic who had nocturnal fits. His wicked behaviour would always follow a fit. "I'd be asleep," she said, "and feel him make the sign of the cross on my chest and his hands would go up to my throat." One night when their girl had been telling lies to a shopkeeper to buy things on credit he went upstairs for her in his shirt only, but she hid in a recess in the bedroom; if he had found her that night he would have killed her, for "I would not have been able to restrain him." "I would always listen to see if he was getting a knife, or had fallen on the fire. One night he went downstairs at 1 a.m. and I and the children followed. He was nude and I made the children go upstairs, and I spoke to him and brought him round the best way I could. I never went too near because when he was like this he always thought people were fighting him. and if he got hold of me I would never get out of his grip. Sometimes after a fit he lies, calling the family vile names for two or three hours, and then he goes to sleep and the next morning he will not have it mentioned. He will insist regularly on sexual intercourse, and if I refuse him he goes into a fit. All the children know about his fits—they have clung to me in the night, but it makes no difference to him if there were a dozen children screaming; he told them of their rotten f——g mother."

I then saw the girl, who told me that a month previously her father had accused her falsely of stealing and beat her on the head and back when she obeyed his command to fetch his clothes. The girl described his tempers to me: "He wakes us all up, shouts like a madman, swears—his language is awful. One night when mother was at night shift he nearly broke the dog's neck. One Sunday afternoon he had mother on the sofa and nearly strangled her. I saw it. Another time in the bedroom he nearly strangled her. I thought he was going to kill her. Once he went downstairs and brought up the carving knife, and I ran into their room and saw he had it near mother's chest and she was trying to get up, but couldn't get up; we screamed, and my sister hit him and he started crying; on other occasions we have heard them nagging and gone to sleep."

It is not surprising that as the girl told me this she wept and said she would never marry and did not want to get married. She wept "I would not like the life my mother has had—I think I would be sure to get as bad a life." I assured her that did not follow, but that it was certain that she would find, like everyone else, that there was a normal association of sex and violent emotions. I explained to her the theory of family sexuality which I have told you, and by telling her of the normal significance of what her father was so unfortunately misunderstanding, I endeavoured to restore her faith in the natural order of things.

That was the first time I saw her and I did not see her again for two years, for I advised forthwith that she be removed from the home environment, and the School Psychological Service arranged for her entry to a suitable residential school. While she was at the school the girl sent me a short letter occasionally, saying how happy she was and how well she was getting on. Unfortunately her mother insisted, and now regrets, that the child should leave the school too soon, and she returned to the unstable family environment. There are, naturally enough, still some difficulties ahead, but on the two occasions I have seen the girl since she left the school I was pleased to notice that the bitterness of her rejection of the institution of marriage and the family was less, and there was discernible some increasing sweetness and hope in life, which I am sure would have been impossible unless

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she had accepted a possible normal significance in the combination of sex and violent emotions.

I have, therefore, given you some demonstration of my interpretation to the children of the association of sex with aggression and fear. Next to be described is the interpretation of the ambivalence of aggression or fear with loyalty and love.

Ambivalence of violent emotions and love.—I often find that mental illness is due to a misunderstanding of this normal ambivalence of love with aggression and fears. Instead of sublimating this primitive emotion with love it becomes separated from love; and this separation may be due to circumstances of birth, to current emotional difficulties of the children with their parents or to accidental factors.

A boy, A. H—, aged 14 years, I.Q. 107, was referred to me after he had committed a sexual assault upon a girl of seven years. He was an illegitimate boy who was not brought up by his parents, and so in all his ponderings of his parenthood he would be confronted with a situation of a separation of primitive emotions from love in his parents. He did not take kindly to his foster-mother. When I interviewed her I found that she was perfectly "correct" in everything she said about her treatment of the boy, and yet there was one thing lacking, for she failed to give the impression of love as apart from duty in caring for the boy. The boy expressed similar sentiments to me. He did not mind her strictness, he understood punishment, but he did not like her. The normal ambivalence was, therefore, broken up, and he could not benefit from her punishment of him because he did not love her. I have said that he was referred to me for committing a sexual assault upon a little girl. He did not know the little girl, he did not care for her, and I pointed out to him that he was repeating the error of his parents and of his foster parents. He had expressed himself aggressively but without love, and he was advised that the unspoken pledge of the sexual act he attempted is loyalty to that person, and that he should not therefore be tempted to use the act unless he means that pledge. The interpretation gave him an appreciation of his behaviour, which was otherwise inexplicable to himself.

A girl, S. K—, aged 15 years, I.Q. 77, was referred by the Probation Officer for thefts and truancy. When the girl was five years old her mother had had a legal separation from her father on account of his cruelty. He had another woman also, but he would not thereafter leave the girl's mother alone. The girl well remembered the father hitting the mother, yet until this sort of thing started she had loved her father and thought there was nobody like him, and had delighted in the thought that she was supposed to be the image of him in looks. Now, however, it was becoming difficult for her to associate aggressive and fearful feelings with love, for her father was so misusing the primitive aggression. She told me that when they, as children, first saw their father hit their mother they screamed and kicked him, and he said, "I thought you loved your daddy"—ambivalence of violent emotions and love was being strained. Once when he hit her mother on the ear the latter fainted, and the little girl thought her mother had died and ran out and told the neighbours. The little girl thought her father might kill her too. So she used to ask her grandmother "what it would be like when you're dead," and was told not to ask questions. So she asked a neighbour, who said "You go to play with the angels when you die—the angels dance and play with toys and fly about." After that the little girl did not bother if her father did kill her. Ambivalence of aggression and love was therefore preserved, though distortedly. The little girl thought it was lovely about the angels until, sadly, at the age of 9 years she found it was not true; it was no longer possible for her to accept her father's aggression with any conception of love or even loveliness, and it was then, at the age of 9, that her symptoms started. Referring to her stealing and truancy she said to me, "I often feel if I had a father I wouldn't be doing these things." And her father would still have been with her if he too had not failed to sublimate the normal association of primitive love and aggression. She was seen on nine occasions,

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and I have had a good report of her behaviour in the subsequent two years from the Probation Officer.

A boy, L. H—, aged 4 years, was referred because he screamed if he did not get his own way and because of bed-wetting and dirty habits. He was a well-developed young boy who had appeared to be normal until the arrival home from the war of his father. He resented the father and screamed at his slightest advance. During the course of five sessions of play therapy and interpretations he played out the œdipus situation and his jealousy of the father and came to accept his position in the eternal triangle. It was characteristic of his play that it all took place on the floor, except that his father was killed in many different ways in the sand tray. The play on the floor consisted of scenes of the boy and mother together. It was my aim to fuse in him the violence he showed with regard to his father and the love he showed for his mother, and thus to establish normal ambivalence. When, therefore, he caused his father on the sand tray to be eaten by a fish, I interpreted that his mother was the fish (i.e. by animal identification) and that they were doing this for him (thus establishing the ambivalence of aggression and love). He poured water over the scene and I told him it was all right to pretend to join in or to pretend to displace father with mother, but of course he could not join in really. At the end of these five weekly sessions he was free from his symptoms of wetting and dirtying and screaming, and again seemed a normal little boy. Yet six more sessions were devoted to his parents, for he was a sad little boy. His father was often in a bad temper and gave either the mother or the child a bad time, and his father had told him that he did not love the boy. The father was finding it difficult to settle down after returning from the army, and was also allowing his own jealous mother to persuade him that the boy was not his own. She wanted the father to leave his wife and son and return to her. I had to point out to the father as well as I could that he was allowing his mother to make him very cruel to his family. An attempt was made to combine the discipline the father exerted on the son with love again, and thus to establish normal ambivalence in the case of the father, as had been achieved in the son.

In the next case the dissolution of normal ambivalence was due to an accident. A girl, A. N—, aged 15 years, I.Q. 70, had been treated on and off for three years by another doctor and then by myself, personally and in a group without much success. When she was five her brother shot her in the eye accidentally and she wore a false eye. She showed none of her pronounced symptoms of instability, however, until she was 12. She then said that people were sneering at her having lost one eye. She developed violent tempers. After I had seen her for twelve interviews she was saying to her mother that she dreaded coming to see me because I knew too much of her business. However, on the 13th visit she told me that she often thought her parents caused her "one eyedness" on purpose, and that she hated them and would like to kill them. Ambivalence for her parents had obviously broken down and aggression was dissociated from love. She said that she would not have minded so much if she had been left the blind eye, but she objected to the false eye. Now this was a curious thought of hers, and I wondered what it had to do with her loss of ambivalence and her dissociation of sexual feeling from love. Her sensitiveness to the false eye had come with puberty and I knew she was becoming abnormally interested in men. I therefore explained to her the psycho-somatic theory of family sexuality, and stressed this aspect, that the woman does not express herself, but the animal or other object of interest to the family—"You see," I said to her, "a normal woman when she loves is not showing herself—it is as if she has a false eye; I want you to think of your false eye as representing your womanhood and sacred love." I saw her again the next week when she was calm and accessible, and three months later the psychiatric social worker got a report from the mother that the girl was very much better. The mother said that prior to the interview which I have described, the girl "had not got a good word for Dr. Turner, but something happened at that interview, and she now speaks very highly of the Clinic and Dr. Turner." I concluded that, by accepting her false eye as standing for love and her normal sexuality, she had had her normal ambivalence for her parents restored to her.

It now remains to explain the interpretation of the two primitive interests which are demonstrated in sexuality. The act of coitus may be considered in

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two parts, that before and that after the orgasm. These two parts represent respectively what is good and evil in life. The first part has to do with hunting a smaller species for food—that is good: the second part has to do with being hunted by a superior species for food—that is bad. The first is to be desired; the possibility of the second has to be freely accepted. It is the misunderstanding of one or other of these functions which is often, I find, to be corrected by the interpretation of the child's symptoms. These same attributes of the sexual acknowledgment of good and evil are also present of course in suckling, but do not there appear to be differentiated so obviously as in coitus.

Killing smaller animals.—I shall speak next, therefore, of the misunderstanding of the good that is intended in the sexual portrayal of the killing of an inferior species by humanity.

A girl, O. C—, aged 7·9 years, I.Q. 100, was referred to me because she had a morbid fear of dying and she also had a vaginal irritation. She told me that she got this fear of dying if her mother goes out of the house—that is to say, if she and her father were left in the house. Should her father leave the house as well and go out with her mother, the little girl had then no fear of dying but feared that her mother, whilst out with father, would be run over.

The sexual symbolism of this was apparent to the little girl, and she admitted to it when her confidence was obtained. She was reassured of the naturalness of her love for her father: it was explained to her why her feelings showed themselves as a fear of dying: and she was told that she can quite happily leave this side of the question while she develops as a normal girl with her schooling and home life. The School Psychological Service had, as always in the cases referred from the department, given me a full report already, and the interview I have just described was the only occasion I saw the child. She seemed to understand the position clearly, and a few weeks later I asked how the little girl was progressing. I was told that she was quite all right and had lost all her fears of dying.

Another girl, O. T—, aged 15 years, who had been before the City Juvenile Court for stealing a clothing coupon book, was referred by the Probation Officer, who wrote, "There is something I feel I cannot understand about her." The girl had left or been dismissed from ten jobs in a year. She told me she lost her jobs on account of "nerves," and she attributed being frightened to being burnt when five years old. Her mother had told her that the doctor had said at the time that it would have effects at the age of 14 years. The burn involved the skin of the left breast, the left loin and groin. Her fear consisted of the idea of men getting hold of her in the dark and killing her. This fear was preventing her taking her place easily in life; for example, she gave up smoking in case it led to friendship with men and then to babies. She appeared to think herself unfit for marriage, while at the same time wishing to be ready in due course for it. Her normal emotions thus frustrated showed themselves as a morbid fear of being killed by a man. It only remained to examine her physically, establish the fact that the scars were no impediment to motherhood, reassure her of this and explain to her why she could accept her good feelings of a man killing her, but to make them a wish and preparation for the future when she would be married.

A boy, B. H—, aged 15 years, was referred to me because of his violent outbursts at home for the last 2–3 years. His mother told me he would have periods of great excitement, when he would frighten her by threatening violently to punch her, and afterwards he would say he only did it to torture her. If his father had been angry with him, he would wait till his father had gone to work the next morning and then would stand over her in bed and say, "What are you going to do now father is not here?"

The boy told me, when asked, that he did not like changing into a man at puberty, and I explained to him that it was these good feelings repressed which had burst forth in violence towards his mother. He was told that he could use his legitimate cave-man feelings in a more gentlemanly way, and that instead of feeling, as he did, that his mother was not spoiling him enough, he should take a

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man's part in reassuring her, especially as she was " nervous." The nervousness of the woman would still arouse his aggression, as primitively it should do, but instead of using this aggression mistakenly in threats of violence to his mother, or actually in intercourse with his mother, which is, of course, forbidden, he could express himself by growing up decently and thus reassure her.

The next case shows a complete contrast in the reaction of a boy to the same emotions. B. G— was a boy of 7·4 years, I.Q. 89, who was referred to me for being dull and backward. His mother had said he would neither eat nor play. It would not surprise you to know that such a quiet little boy was inhibiting strong emotions. He did indeed tell me in his first interview that he hated his mother and hated his sister, and he was then angry with me for obtaining his confidence. He did not indulge his primitive sexual instincts of love in misplaced violence as did the previous boy, but on the other hand he also was unable to sublimate his emotions into the normal affectionate aggressiveness of a boy of his age.

Killed by bigger animals.—I now come to consider that aspect of the emotions of sexual relationships which considers the danger to the family of destruction by animals of a superior species.

A boy, F. H—, aged 11 years, I.Q. 146, very nervous and with so-called abnormal fears was referred to me for treatment. He would not go upstairs alone even in the daytime; he dreaded, e.g., that he would come across a dead body—he was fascinated by fears of death. At his first sand tray he was left to his own devices, but at the second he was asked specifically for a sand tray scene explaining his fears. He did this scene (Fig. 7) of a boy about to be attacked by a man with a

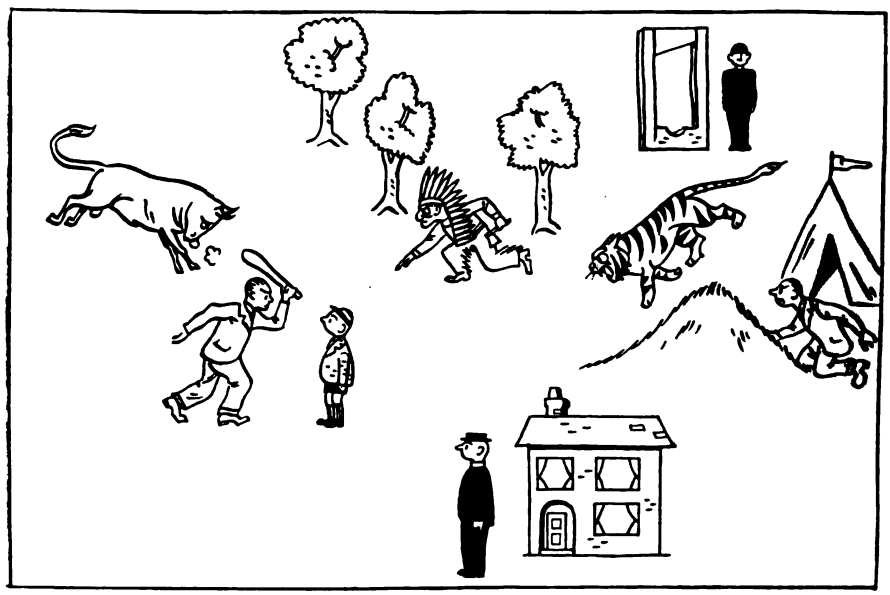

FIG. 7

weapon, a bull, a Red Indian, a tiger which is friendly with a deformed " ghost-like " man and by the latter himself. The boy also feared being taken to the guillotine. The clergyman was not just the peaceful figure which he appears in the picture, for the boy said that when he is only a yard off the clergyman will change into a wicked man or ghost and kill the boy. The boy said that these things often happened in his dreams and he wakes up as he is about to be killed ; in

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daytime he often fears these things may happen to him, especially when it is dark. I deduced that these fears were a misunderstanding of his normal sexual feelings for the superior species, and told him to imagine that he can be killed an infinite number of times within the limits of the sand tray and he will always come to life. He proceeded to imagine them all, one after the other, killing him, and in each case he came to life, " with enormous power " he said, and killed them by hitting, leaping on or rolling on them, crushing them with boulders, etc.

He was then told to imagine that all the wicked men and animals can also come to life an infinite number of times. Numerous individual combats then occur, each side being killed in turn and then he passes on to the next combat. My interpretation was that his fears were sexual feelings, that actual death cannot come by these feelings, and that, therefore, they need not trouble him. After his first few visits his mother told me he was very much better, and it was only necessary for him to attend on nine occasions.

My next case was able to make the principal adjustment to her difficulties before her fifteenth session, and by the twentieth session she was discharged, recovered from suicidal impulses, hysterical outbursts and moodiness. I. V— was a girl of 11 years, I.Q. 120. Her parents had separated when she was six years old, and the father, who had left the home, subsequently remarried. The girl led up after several sand trays to say that she had a bitter hatred of and desire to kill her father, but it was evident that this represented an underlying frustrated love for him. Fortunately she was able to see this, and came to accept a normal significance for her, a girl, identified with the superior species, wishing to kill her father for the sake of love. This was the turning-point in the treatment, and her outlook became much sweeter and her mother reported that the girl was very much better. It was then possible to pass on to seeing a normal significance in her suicidal impulses —it was again a question of frustrated love, but it was easier for her now to accept this. At her next sand tray she depicted her father watching her play hockey. She put her father's car on the hockey field near her ; I put her on it ; she laughed and put herself prone in front of his car, and enjoyed me sending the car running over her. Her suicidal impulse had been the expression of a primitive invitation to love. She could accept it now for she had already accepted her desire to kill her father as a desire for the climax of love's sexual demonstration. It is a relief for an emotionally tormented child to understand these things. Her mother told me that the girl was happy and laughing for the first time and enjoying school.

My last case is a slight one. I only saw this boy, A. L—, aged 8 years, once. His mother described his extreme nervousness ; little things annoyed him and he wanted to cry and scream. Unlike his brothers and sisters he was extremely affectionate towards his mother, liking to be petted and kissed, and she would then make a great point of telling him there was no cause for fear. This was absurd, for his history gave him ample reason to expect fear in life. He had been circumcised at 18 months, had his tonsils removed at three years, had an accident from a motor cycle at five years and spent six unhappy months in a convalescent home, and at seven years he had been in the London blitz and the family was evacuated to a strange town. I advised the mother that in cuddling and consoling him she should appreciate that this aspect of motherhood is to reassure the child that life is possible in spite of very real causes for fear in the world, and not to hoodwink him that there is no fear. I had in mind, you will now know, that the mother in these circumstances would, to teach the child, be identifying herself unconsciously with the superior species which the child should rightly fear, and that the boy must accept the fear of such animals or their civilized equivalent fear. I had the following short conversation with the boy :

> What was the blitz like ? Fires (timidly).
> Were you frightened ? Yes.
> Are you still alive ? (in wonderment). Yes (amazedly—the thought did not appear to have occurred to him before).
> Were you frightened at the convalescent home ? Yes.
> And you are still alive ? (in wonderment). Yes (in quite cheerful mood by now).

I was trying to show him that life, in spite of knowledge of fear and death, can be possible and cheerful.

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The use of the theory of family sexuality in the interpretation of children's play shortens the treatment. I know that several analysts are not aghast at 200 sessions for one patient, but it is my custom, if I have not cured the child, or at least obtained a marked improvement of symptoms before the twentieth session, to consider that I have failed or am failing. To-day I have told you of several cases in which a straightforward interpretation by the theory has assisted in the recovery from symptoms, and has also, I hope, done something towards laying a sound emotional foundation for the children. Such a simple application of the theory is not always possible. Life has very complicated aspects, but it has to suffice us if, from time to time, we can take one step forward.

I wish to thank Dr. T. W. Davidson, Medical Superintendent of the Towers Mental Hospital, for permission to publish the case material of the Francis Dixon Lodge Child Guidance Clinic. It is also my pleasure to thank Dr. Agatha Bowley for her Psychologist's Reports on the cases seen at or referred from the School Psychological Service of the Leicester Education Department, also the Leicester Probation Officers for their assistance with the cases referred from the Juvenile Court. Finally, my thanks are due to Mr. M. Pownall for his skilful drawings of the sand trays.

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OBSERVATIONS ON THE USE OF TRIDIONE IN DISTURBED PSYCHOTICS.

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TRIDIONE (Abbott) is 3.5.5-Trimethyloxazolidine-2, 4-dione, and has been demonstrated clinically to have an inhibitory effect on *petit mal*, myoclonic and psychomotor seizures in epilepsy. Gibbs, Gibbs and Lennox first demonstrated a similarity between the cortical dysrhythmias in certain cases of schizophrenia and those of psychomotor epilepsy, whilst Kalinowsky and Putnam, as a result of these findings, gave the anti-convulsant dilantin as a successful sedative to 60 cases showing mental symptoms. Since tridione has a specific action against psychic equivalents in epilepsy, it was thought that its administration to patients showing chronic mental disturbances might result in at least a similar improvement.

Ten cases were chosen from a disturbed male ward, who were physically fit and between the ages of 20 and 49 years ; they had all had previous treatment without any appreciable prolonged improvement, and their average duration of illness since admission was 58·4 months.

Haemoglobin, red and white cell counts, erythrocyte sedimentation rates, blood urea and urine examination were normal in all the patients. Weekly full blood counts were made in all cases, and also on ten similar controls throughout the time of the observations.

The sedatives they were having were withdrawn, and two days later Tridione was given in doses of 0·3 Gm. twice daily to each patient ; after seven days this dose was increased in frequency to three times daily, and after a further 21 days to four times daily. The drug was given for an average of 98 days, the mean dosage being 106·2 Gm. at the end of treatment, or 1·08 Gm. per diem. In seven cases the drug was withdrawn abruptly, and in three cases gradually ; all the patients were carefully observed after cessation of the treatment.

It is obviously not possible in this small series of patients to discuss the relative merits and results of Tridione therapy in individual diagnoses, but some general results and comments on the effect of Tridione in cases of chronic mental disturbance seem to be worth recording. Clinically it was noticed that very little added sedation was required during the period that Tridione was given, only four patients needing additional paraldehyde, and then only in a total of 10 two-drachm doses in the whole 96 days of treatment ; previously six of the ten cases had been on paraldehyde, two drachms three times

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daily, and three of the remaining four had needed the drug at intervals. It would thus appear that Tridione has, in common with other anti-convulsants, a general sedative action, and that in this series its value was at least the equal of paraldehyde.

One patient has now worked willingly and well in the ward for a period of seven weeks, whereas previously he had not been known to do this for longer than a few days at a time, and then grudgingly. Another patient had repeatedly smashed windows because, he said, he preferred his bed and broke the windows because he knew he would be returned there: after having had Tridione for 41 days he asked to be allowed to get out of bed, and he has remained up with no more impulsive outbursts. A third patient now openly admits and talks freely about his hallucinations; before, though they were obviously present, he had vigorously denied their existence. In these cases it would appear that Tridione, as well as being a sedative, also affected their behaviour. It was noted by Merritt and Putnam, Lennox (1940) and Blair, Bailey and McGregor (1939) that Dilantin was specific for psychic epileptic equivalents, and these findings have been in part related to the alteration of behaviour patterns.

Following the Tridione alone, six patients had courses of electro-convulsive therapy (E.C.T.) with an average of seven convulsions, combined with Tridione in a dosage of gm. 0·3 four times daily. As a result of this treatment a further patient who had always been solitary, and often noisy and violent, became quite sociable and agreeable. Another patient, after 2 E.C.Ts., became quiet and subsequently depressed, though on all previous occasions following E.C.T. he had become abusive, aggressive and violent. Both these patients had previously had other sedatives and E.C.T. when necessary, but had never responded in this way before. It was found that the current had to be slightly increased to produce the fits.

In six of the ten cases in which Tridione was given, the pulse-rate was noticed to fall by about 5–15 beats per minute after the drug was commenced, whilst the same change occurred with the subsequent increases in the dosage, but there was always a return to the usual pulse-rate in 1–3 days and there were no cardiac dysrythmias. The small fall in the pulse-rate is interesting in view of the fact that one of the toxic symptoms of Tridione, namely the "glare phenomenon" in which all well illuminated objects appear "as if covered with snow," has also been noticed occasionally by Carroll (1945) in digitalis therapy, but with Tridione the pulse-rate returned quickly to normal and there was no tachycardia when the drug was withdrawn.

After a total dosage of 97·2 Gm. of Tridione over a period of 91 days one patient developed a pyrexia reaching 99·2° F., but nothing abnormal was found on repeated physical and pathological examinations beyond a slight reddening of the tonsillar beds and fauces. Tridione was continued and he was observed carefully, but he recovered enough to be allowed up in a few days without specific treatment; his white cell count has since remained normal. Except in this one case none of the toxic symptoms mentioned in the literature, such as the glare phenomenon, skin rashes, or nausea and vomiting were noticed.

Pathological findings showed an average leucocytosis following the initial doses, which gradually fell to the level of the average leucocyte count of the

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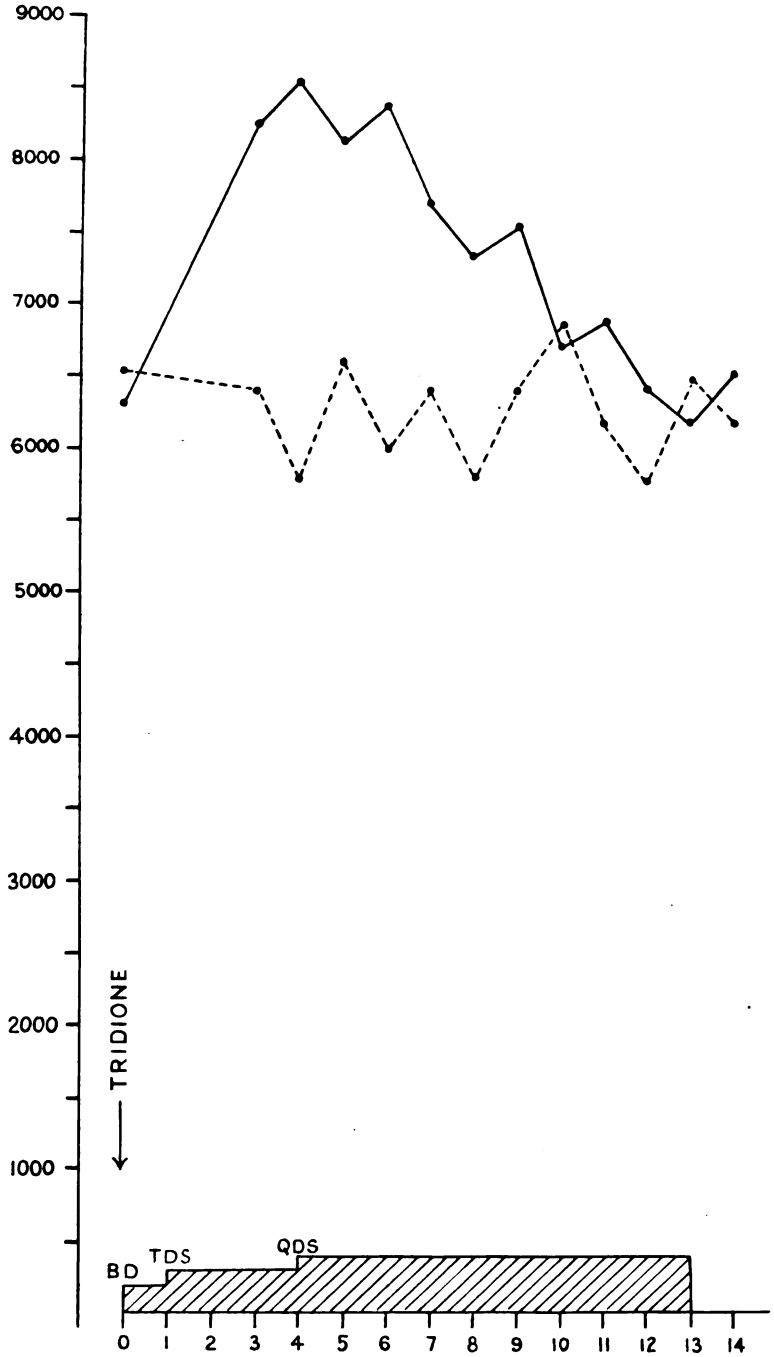

FIG. 1.

Straight line: variation during treatment.
Dotted line: variation of controls.

All values represent averages calculated from 10 cases.

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ten controls at the end of three months, as shown in the accompanying graph. An eosinophilia was also pronounced in four patients, one differential count reaching 14 per cent.; this was also observed by Lennox (1947): there were no significant changes in the red cell counts, haemoglobin, blood urea or erythrocyte sedimentation rate in any of the cases. A leucocytosis and eosinophilia concomitant with Tridione therapy was described by Robinson, who attributed the findings to proved infestation with common intestinal parasites. In this series, however, the rise in the average white cell count is so marked that it deserves special mention from two aspects: first, that although the early readings following the administration of Tridione are well above the level of the counts in the controls and remain raised for twelve weeks, they are still within the limits of normal values; secondly, the patient's counts fell to the level of the controls in three months. This may be of significance in that two recorded deaths in America following Tridione from aplastic anaemia with agranulocytosis (Mackay and Gottstein, 1946), and aplastic anaemia alone (Harrison, Johnson and Ayer, 1946) occurred only after ten and six months respectively, suggesting that the blood counts after the first three months may be more important than those made during this time. Non-fatal cases of granulocytopenia have been recorded by Lennox (1947) and Greaves (1946), and a death from agranulocytosis, probably attributable to Tridione, in a child of ten years taking four tablets a day has recently occurred in this country.

In conclusion these observations suggest:

(1) That Tridione can successfuly be employed in psychiatric treatment, not only against certain types of epilepsy, but as a sedative, and that it may modify the pattern of behaviour.

(2) That Tridione combined with E.C.T. may in some cases be more successful than the combination of E.C.T. with other sedatives.

(3) That it would appear that a leucopenia, if occurring at all, is more likely to be found after the first three months of treatment.

I would like to express my thanks to Dr. E. Cunningham Dax for his suggestions and advice, and to Dr. A. G. Hucker for his technical help.

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THE USE OF MUSIC IN GROUP THERAPY.

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HISTORICAL INTRODUCTION.

PYTHAGORAS appears to have been the first to recognize "the profound effect of music upon the senses and emotions." He tried to influence the mind and body with what he termed "musical medicine" (1).

He declared that the soul could be purified from its irrational influences, and he made detailed investigations into the therapeutic value of the seven different Greek keys. Pythagoras is said to have cured many mental illnesses "by having certain specially prepared musical compositions played in the presence of the sufferer." For example, Iamblichus, in his life of Pythagoras, relates how he devised certain melodies against despondency, others against anger and still others against desires.

Pargeter, an English alienist of the eighteenth century, seems to have been the next to use music on a scientific therapeutic basis. He systematically studied its effects in cases of mania (2), and emphasized "that a considerable knowledge in music will be requisite to select those compositions and instruments and that arrangement of the instrumental parts as may exactly correspond with the *pathos animi* . . . this must be regulated by the feelings of the patient, which may easily be ascertained by attentive observation to the modulations and style of composition." In this Pargeter closely follows and elaborates Pythagoras's plea for a specific music therapy.

After this there appears to have been no notable work on music in psychiatry until the present century. Many interesting studies have recently shown its value in individuals and large groups of patients.

Music has been applied as additional treatment on disturbed wards (3). It has also been used in the resocialization and rehabilitation of other mentally ill patients, including convalescents (4), (5), (6), (7), (8).

Some writers were more concerned with investigating the effects of different types of music on different types of patients (excitable or quiet). They centred their attention on alteration of moods, release of energy and improvement of concentration and interest. They gave useful recommendations in a

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non-specific way, basing their therapeutic approach more on descriptive than psychodynamic principles (8), (9).

Tilly's work on analytical lines stresses masculine and feminine neurotic qualities in musical compositions and in composers, to which she considers listeners are likely to react according to the strength of the respective qualities in themselves (10).

As in recent years there has been an increasing interest in group therapy, especially in small groups, music therapy has been included as an additional aid. Several writers (11), (12), (13), (14), dealing with this new aspect, appear to apply the principles previously mentioned, with little systematic differentiation of musical styles and clinical disorders.

There have been a number of valuable contributions by professional musicians on the psychological aspects of music, such as Hanson in America and Howes in this country. These are closely allied to our main subject (15), (16). Hanson, like Plato and Damon of Athens, Socrates' musical tutor (1), points out the powers of music "for good and evil." He emphasizes how, "when through the radio the country is literally flooded with sound, it seems reasonable to assume that music is destined to play an important part in helping to preserve mental sanity on the one hand, or, if misused, to add to the emotional strain of an age already over-taxed by disruptive forces."

Aims of Present Approach.

Entertainment, recreational and educational aspects were first in the foreground as part of the general activities in our hospital. Monthly concerts were given by professional musicians under the auspices of the Council for Music in Hospitals. There were gramophone record programmes of serious and light music twice weekly. Also attention was paid to earlier work by others in disturbed wards, and music was played to refractory patients at bedtime with the aim of quietening their general conduct and improving their sleep.

Like others, we applied so-called stimulating and sedative music. We found such classification unsatisfactory, as patients were often not soothed or stimulated by the respective pieces. In fact, with programmes of purely sedative music lasting more than half an hour, patients became irritated and started fighting. Mixed programmes were unquestionably more appreciated, and produced temporary beneficial effects on moods, as with normal people. There was no noticeable effect on sleep.

These general, more superficial, but none the less valuable forms of musical approach, which are still being applied in our hospital, we would hesitate to call specific Musical Therapy.

In order to study the latter, we restricted ourselves to a small group of patients, and concentrated on music as a method of group therapy, analogous to other arts, such as painting and psychodrama.

We wished to observe how far the emotions aroused could be experienced in common. We encouraged self-expression and insight, and aimed at the improvement of interpersonal, including doctor-patient, relationships.

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These aims were fostered by discussion and interpretation. Our intentions were therefore essentially the same as those of many other group therapists (17), (18), (19), (20), (21).

What advantages does music have over the other arts? Perhaps music allows the most indirect form of emotional release, while painting, and especially poetry, are more direct methods of self-expression. Also a number of patients are more interested in music than other forms of art. We therefore wondered whether through music, inhibited patients would be helped to overcome their lack of ability to express their emotions. Similarly, the uninhibited types might obtain better emotional control and integration.

We decided to study reactions to different styles and periods of music, particularly Classical, Romantic, Contemporary and Folk Music. A subsidiary classification into personal and impersonal music proved helpful in differentiating various reactions.

These distinctions were based on the views of Howard Hanson. He emphasizes the highly formalistic structure inherent in the Classical age. He contrasts this music, which is only secondarily emotional, and has a somewhat impersonal, cosmic character, with the Romantic school of composition, where emotion is more intensified and personalized. He suggests that "the expression of emotion in music seems to be bound up in the contrast between dissonance and consonance, the former producing a sense of tension and conflict, to be either heightened by progression to a sonority of still greater tension, or resolved by a succeeding consonance." Accordingly we decided to see how far we could release emotion in Romantic music, and how far this might be the mode of choice for affective and non-affective types. The modern Impressionistic school (e.g. Debussy, Ravel) with its descriptive moods provided a further field of observation. We also studied the effects of the more complex, dissonant and rhythmically irregular twentieth century music (e.g. Stravinsky, Gershwin, Shostakovich and recent Jazz composers), which seems to revert to primitive or pseudo-primitive forms. In addition, we played examples of the contemporary atonalists (e.g. Berg, Bartok, Hindemith), and finally investigated the response to traditional songs and folk music.

Methods of Approach.

(1) The setting chosen was a small hospital library. Occasionally the main hall of the hospital was used for large-scale works, e.g. Messiah, certain symphonies.

(2) The number of patients was kept nearer 12 than 20 and the basic structure did not alter.

(3) Members of both sexes with a variety of syndromes were selected, e.g. neuroses, schizophrenia, paranoid states, manic-depressives. The patients were mainly young or middle-aged adults.

(4) Sessions were held once weekly for an hour. Occasionally an extra session was held when members wished to listen to a single long work again.

(5) A gramophone with pick-up was used, and was supplemented occasionally by active participation of the group in a percussion band or singing traditional and folk songs.

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(6) Records were chosen to cater for all tastes and schools of composition; the details will be given later. The Arts Council lending library proved most helpful in supplementing our Hospital record library.

(7) We purposely introduced entertainment music each time in the early stages, without stimulating discussion, to avoid boredom.

(8) Our work commenced in July, 1947; after a few months we decided to introduce a monthly lecture-recital in simple terms, illustrative of the historical development of music. It was felt this would increase appreciation and so improve the effects of group therapy.

(9) Patients were asked whether they liked or disliked each piece and to give their reasons.

(10) It was also noted whether any special emotions or thoughts were provoked.

(11) Group discussions followed, not only directly concerned with the music, but also with any problems, personal or general, which arose.

Observations.

The solid core of the group consisted of some 14 patients. There were almost equal numbers of inhibited and non-inhibited. This term is to be understood as implying approximate differences in constitutional reactions.

The inhibited included schizophrenics and neurotics, mainly the former. The non-inhibited were represented by manic-depressives and paraphrenics. Although there is disagreement among psychiatrists on the subject of paraphrenia, our cases were undoubtedly affectively labile and showed marked endomorphic features.

Some 30 other patients of different clinical types were irregular group members. On the whole the inhibited attended less regularly than the non-inhibited, which was to be expected.

(A) *The Classical Style.*

This includes such composers as J. S. Bach, Handel, Haydn, Mozart and Beethoven. We deliberately refrained from giving our group much classical music at first. As the sessions proceeded, education resulted in increased enjoyment of the classics, whereas other types of music were more immediately appreciated. It was perhaps significant that classical music very rarely gave rise to personal associations, and these were of a very stereotyped character. This is not surprising, in view of the more impersonal, formal nature of the classics. There were certainly different types of group emotional responses. Handel's Messiah produced exhilaration, Mozart's Clarinet Quintet and Haydn's Emperor Quartet a feeling of mild serenity, Bach's Air on the G string a mood of solemnity as with normal people. Classical music shows very contrasting influences; it tends to bore or leave the listener indifferent through being impersonal and lacking in sensual stimulation. On the other hand, it can be uplifting in a cosmic sense, and then appears to give more security through its inherent firm formal structure. This was very evident in the

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group responses. There were no marked differences in the reactions to classical music displayed by the different clinical types.

(B) *The Romantic Style.*

This includes composers from Schubert to Brahms and Wagner together with nationalists (e.g. Grieg, Dvorak, Mussorgsky). Most of these compositions were effective in arousing *personal* emotional reactions and in releasing sensual inhibitions. The group as a whole liked romantic music, but a few of the more inhibited were detached or disliked the more stirring sensual music, e.g. Rimsky-Korsakov's *Scheherazade*, Berlioz's *Roman Carnival* Overture, Wagner's *Ride of the Valkyries* and *Magic Fire Music*. The following are examples of associations to various romantic compositions:

(1) *Scheherazade* (last section). This work was not known to anyone, and was deliberately played without any preliminary information being given. A middle-aged extraverted paraphrenic revived memories of sexual adventures in her youth; she had similar reactions to Borodin's *Polovtsian Dances*, which had also been played without any remarks. These dances, too, are particularly stimulating to the senses.

An inhibited neurotic produced a piece of sexual symbolism when thinking of an African snake charmer with his snake.

A catatonic schizophrenic with extraverted features and pyknic build thought of "the ground covered with blood in a bull fight." This was followed by other aggressive phantasies (e.g. a sandstorm in a hot desert). He had personally experienced both of these events, and found the emotions aroused very unpleasant. He suggested that such music should be used "to incite a fighting spirit if necessary."

(2) Schubert's *Ave Maria:* The group as a whole was emotionally stirred, and one, an extraverted paraphrenic, a Roman Catholic, was in tears.

(3) A Chopin Mazurka: A schizophrenic said it made him melancholy, without releasing his sorrow.

(4) Tchaikowsky's 5th Symphony (slow movement): In contrast to the slow movement of Mozart's Symphony No. 40 in G Minor, which had been played immediately before and to which the group generally had reacted by lack of interest or boredom, this work stirred up lively emotions, personal associations and active discussion. One inhibited schizophrenic said, "Most people like to be stirred up and escape from themselves." Another schizophrenic with marked affective features and pyknic build said the work stirred her feelings unpleasantly. Two other very inhibited schizophrenics would not admit that they were affected, but appeared to rationalize as a form of resistance. One of these was later noticed listening intently to a wireless performance of this work. An anxiety neurotic (morphine addict) drew a picture showing the rise and fall of emotion in the music and felt no solution had been reached. An extraverted paraphrenic felt the composer was grappling with a personal problem. A few days later she wrote a letter, saying "the music has made me think of governments struggling with big problems and farmers with the soil." She also felt that the importance of love in life was depicted in the music.

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(5) Wagner's *Ride of the Valkyries*: Here a short preliminary explanation was given. A grossly inhibited schizophrenic said he was not interested "because gods and goddesses are not real." Another inhibited schizophrenic with affective features and pyknic build strongly disagreed. She said she had had personal religious experiences, which had been very definite. When asked about these, she said, "I felt God inside myself."

The anxiety neurotic mentioned above said Wagner was her favourite composer "because he causes stormy feelings inside me which I like to experience." Then she added in a querulous tone of voice, "otherwise they are asleep."

A general discussion followed on the power of music to affect one's emotions, and members gave examples of how they had been annoyed or depressed as a result of listening to different works.

In general it was very clear that romantic music produced much more direct emotional release than the classics without necessarily providing any sublimation. Such release as in individual psychotherapy was accompanied not only by feelings of pleasure, but also at times by marked discomfort.

The positive group atmosphere was more noticeable than with classical music, but interpersonal relationships were rather spasmodic.

(c) *Modern Impressionistic Style.*

The group readily accepted this style, especially where it was of mood descriptive type, e.g. Debussy, Saint-Saens, Butterworth. This was probably because withdrawn, detached psychotics were further tempted by this music to escape into phantasies, while the non-inhibited (affective) patients seemed to be attracted by the sensuous background. The following are examples of reactions:

(1) Debussy's "*L'Après-midi d'un Faune*": No preliminary information was given. Everybody liked it, including one very inhibited schizophrenic, who was rarely interested in anything. Another schizophrenic who, like the rest, did not know it, described it as "like going into a wood with sunbeams and shadows, birds singing and whispering leaves. It is on a hot day in the morning at first and the day progresses and the music ends with evening sunset." It was interesting that this young man, normally very restricted in his interests, was capable of responding in this manner, and later in the same day he came to one of us saying, "A new field of interest has been opened to me by attending these group sessions; I was not aware of understanding music before."

(2) Saint-Saens "*Danse Macabre*": An extraverted paraphrenic, who normally is very dignified, became extremely excited, spitting, swearing and gesticulating. One schizophrenic said it "calmed" her—the last reaction to be expected from a normal person to such a piece.

(3) Butterworth's "*Shropshire Lad*" Rhapsody: This was also unknown and unannounced. All the inhibited patients liked it, some very much, but there was an exception to the general rule with the non-inhibited types, two of them very definitely disliking it. One of them was able to give as a reason

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that "it was too broken up in style." This perhaps suggests that the more affective types feel the need for emotional control.

In general it was felt that group atmosphere was slightly improved by comparison with the effects of classical and romantic music.

(D) *Contemporary Music.*

We divide this into four styles which tend to overlap: (1) neo-romantic, (2) expressionistic, (3) pseudo-primitive, and (4) atonal.

With regard to the more serious forms of contemporary music, we observed that younger members of the group reacted with tolerance, and wished to understand them better by repeated performances. The older members, who grew up in the late Victorian and Edwardian eras, were as a whole indifferent or averse to hearing them again. Apart from the obvious factor of increasing conservatism with age, one must remember that these older patients had grown up in more secure times and were used to more conventional musical forms.

It was interesting to observe how far the regressive features of some of the modern compositions corresponded with the regressive nature of the clinical disorders. It can be assumed that there are positive as well as negative sides of this regression, in leading away from rigid over-civilization and helping archaic and personal unconscious forces to come into consciousness.

How far can this music, which is disliked by most so-called rational people without special education, appeal to the more irrational and emotionally disturbed, because it helps them to experience and integrate their unconscious? How much value is there in a common experience of this Unconscious in a group, in contrast to an individual's experience on his own with or without analysis?

We also dealt with modern dance music. A number of different examples of this were given and found very little favour. One or two only of the younger members said "This music would be all right for dancing," but they did not want to listen to it, which is undoubtedly a partial explanation of their response. Other probable factors were that only a few patients under 21 attended the group; also a fear of the crude sensual stimulation may have resulted in rejection of this type of music as a defence-mechanism. Finally, although the group had very little education and training in music, they appeared to have acquired some sense for quality, which partly tended to prevent their accepting the cheaper forms. All the reactions to dance music appeared to be independent of the clinical type of disorder.

As a first illustration of the response to serious modern music, we may quote Sibelius' 5th Symphony. This was felt by some patients to be "like a cold wind," especially in the last movement. Some disliked it, but others obviously felt it bracing, especially the more inhibited, more introspective. One of the latter, who showed a well-marked affective component as well, said it aroused certain feelings about which she could not speak publicly. In a private interview, she revealed that it had recalled memories of two passionate love affairs with men while her husband had been away in the Army. She thought of these adventures with great pleasure and without a sense of guilt.

Examples of strongly rhythmical and rather cynically impudent music

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by Shostakovitch and Prokofiev found little favour, only one or two patients finding it mildly stimulating.

On the other hand, Stravinsky's "*Rite of Spring*" provoked lively interest. A paranoid professional musician thoroughly disliked it, said "the composer should be shot," and walked out before the end. The anxiety neurotic who was a morphia addict said that if she had been present during the dance she would not have been responsible for what she did. She went on: "I think it is good for people to let themselves go from time to time, for example, by drinking too much as well."

Several others liked the exciting feelings aroused very much, and two, who were very inhibited schizophrenics, were obviously surprised at the effects produced on them. One of these said it "made her think of lunatics and children getting out of hand," and "of savages pretending to be religious, but really enjoying wicked cruelties," and "These thoughts were unpleasant: they made her go on to think about her parents, whom she had always regarded as humbugs about religion."

One schizophrenic, a West African native, said the music was genuinely primitive, and it made him think of the religious sacrifices of children he had seen in his youth.

A lively discussion followed about social tolerance towards free display of the emotions, and several of the patients of inhibited and non-inhibited type were drawn together and established better interpersonal relationships.

In contrast to these musical examples, which still employ fairly conventional forms, we also played works by the atonalists.

A duet for two violins in the sixth-tone-system by Haba was likened by a psychopath to modern painting. He said it reflected our own discordant restless times and his own continual change of jobs. An inhibited schizophrenic liked it and wanted to hear it again. He felt it meant something to him, but could not say what it was. The remainder appeared to find it meaningless or funny, two of them exclaiming in the middle, "Is that music?" (an attitude which was never observed on any other occasion).

The slow movement of Bartok's 2nd string quartet was found to have more melancholy power. Alban Berg's *Allegro Misterioso* from his "*Lyric Suite*" for string quartet was found unpleasantly puzzling by all except the one inhibited schizophrenic who had been particularly interested in the Haba duet. Hindemith's *Scherzo for Viola and Cello* was more generally accepted "because it has more shape and melody."

Finally an Octandre for wind instruments by Varese produced the strongest effect upon both types, e.g., the inhibited schizophrenic who had liked the Berg and Haba, but otherwise rarely expressed any strong feelings about music or anything else, very definitely disliked it. On the other hand, another patient of similar clinical type felt the "mechanistic force in this piece might be good to sweep one's cobwebs away."

(E) *Traditional and Folk Songs.*

Examples were taken from various nations, so that only certain pieces were already familiar. The results were quite dramatic. There was a marked

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increase of group cohesion, without exception. The patients began chatting in a friendly fashion among themselves, being obviously deeply and pleasantly stirred. It reminded one of a continental café or English public house. Therefore we followed passive listening to this type of music by getting the patients to sing such songs themselves. The group atmosphere was enhanced by the pianist being a member. This was the paranoid professional musician mentioned earlier, who had been extremely suspicious, hostile and withdrawn for years and within the group became much more friendly, especially in relationship to the doctors.

After these experiences in the small group it was decided to ask the Arts Council to arrange for a well-known professional folk-song singer to give one of the monthly concerts to a big audience. Although most other concerts had been well appreciated the reception in this case was outstandingly enthusiastic, thus confirming our experiences in the small groups. This music, based on eternal human and cosmic relationships, strikes a universal chord, which binds people together, whether they are normal or emotionally disturbed.

(F) *Miscellaneous.*

For the sake of completeness, we comment on examples of comic and simple entertainment music.

To the former, the group was extremely indifferent. This was presumably because of their egocentricity and corresponding lack of sense of humour. The entertainment music included examples of marches, musical comedies, sentimental film songs, and different types of waltzes and other old-fashioned dances.

In general the group was exhilarated, as with normal people. With the exception of Strauss's waltzes, they did not express any marked wish to have any piece repeated. A discussion about Strauss's waltzes revealed the tendency to escape in phantasy into a glittering, easy-going Viennese world.

Discussion.

As a result of our observations it has become clear to us that increased group cohesion and increased interpersonal, including doctor-patient relationships, within the group, follow the use of certain types of music. Emotional release and control resulting in better integration of personality can be facilitated by music in a group. These effects represent a therapeutic gain, as a substitute for, and addition to individual psychotherapy. As emphasized before, there is evidence of specific responses to different musical styles. The *classical* style tends to provide security through its formal structure to all patients, irrespective of clinical type. There was often a marked increase in group cohesion while listening to this style, probable due to the cosmic character of some of these great compositions. But this response was only noticeable in the later stages with increasing education. The *romantic* style produced emotional release, especially of sensual inhibitions. The non-inhibited found possibilities of displacement of instinctive impulses, while the inhibited types were enabled to experience their feelings more fully. The drawback with a

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number of patients, especially of the inhibited types, was that they felt unable to integrate the thoughts and feelings aroused. This makes it obvious that more research is needed to differentiate the types of romantic music which are suitable for therapeutic purposes. The *impressionistic* school of music appears at this preliminary stage to have no marked therapeutic value, except by stimulating interest in the withdrawn inhibited types and slightly improving group solidarity in all types. More beneficial effects were evident from the use of serious *contemporary* music. It had sufficient power in certain compositions (i.e. Stravinsky, Bartok, Varese) to bring repressed unconscious forces into consciousness in inhibited schizophrenics where romantic music had failed to operate. Nevertheless, we must admit that the reaction in these schizophrenics, as a whole, was not as marked as with surrealist paintings in other therapeutic groups. This may be due to the lack of obvious symbols and even greater lack of form in certain modern compositions. However we observed that this strongly rhythmical and dissonant style with marked primitive features awakens in psychotics a note of recognition in accordance with their own disintegrating, regressive tendencies. As with romantic music, careful selection is required, because integration is not necessarily fostered and, in fact, the patient may be made worse by being unable to come to terms with the forces aroused. *Modern dance music*, although characterized by prevailing barbaric rhythms, only appeared to act on a mildly sensuous level, and produced no noticeable favourable effect on individuals or the group. There was no doubt in our experience that improvement of group cohesion and interpersonal relationship was more evident in the response to *traditional and folk song* than to any other types of music. Although these stir up archaic unconscious forces, they clearly act as integrating factors.

Our earlier assumptions that the subverbal response to music possesses advantages in all patients (but especially the most inhibited) over more direct forms of self-expression through art appear to be justified. This suggests that for some patients a preliminary approach through music might facilitate other therapeutic methods of reaching the Unconscious.

In every Mental Hospital there must be a by no means negligible number of fairly well preserved patients who should be suitable for this type of group treatment.

In conclusion we would emphasize the particular therapeutic importance of *form* in music as in the other arts. A content with strong emotional power but no apparent form appears to be more disturbing than a content without marked emotional power, but with a firm structure. Uncontrolled emotion is rightly felt to be dangerous, and this was verbally expressed by a patient. He said he felt that music by Bach which was solemn and sad "was so helpful because it was so balanced." It therefore appears necessary, as with normal people, to give some elementary technical instruction about musical styles. This particularly applies to contemporary music, which might be made more intelligible to the younger generation, which has grown up in the unsettled period which it reflects.

We are inclined to think that in most psychotic patients the aesthetic sense, especially the response to rhythm and melody, is comparatively better

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preserved than other intellectual and emotional qualities. Attempts at personality reconstruction may therefore be made by appealing to the fundamental human need for shape. This universal need was mirrored in our small group, for whom the experience of eternal forms of beauty induced security through inner integration.

Summary.

(1) Music was used in a small group of psychiatric patients with various clinical disorders. They were mostly psychotic, and were fairly equally divided into inhibited and non-inhibited types.

(2) The response to different musical styles was investigated, particularly with regard to interpersonal relationships in the group.

(3) Different therapeutic effects are enumerated, and advantages and disadvantages of the respective styles are discussed. Also certain differences in reaction become evident according to clinical types.

(4) Romantic music, although often producing emotional release, did not tend to facilitate group cohesion.

(5) Contemporary serious music had a slightly more integrative effect than the previous style.

(6) Classical music occasionally provided a greater degree of group cohesion, but mainly in the later sessions, as a result of progressive musical education.

(7) Traditional and Folk songs were quite the most effective in increasing the harmony of the group as a whole, and in fostering integration of the individual personalities.

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THE MEASUREMENT OF THE STRUCTURE AND BEHAVIOUR OF THERAPEUTIC GROUPS.

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INTRODUCTION.

EVER since Group Therapy became established as a scientific method for the furtherance of mental health, therapists have looked for ways of measuring the behaviour of the Group. It is clear, for example, that there are important differences in structure between a group of people newly assembled in a railway carriage and those who share the same dining table at the end of a long sea voyage. Interpersonal relations have been established in the latter company, and each member has himself achieved some kind of relationship to the group as a whole. It cannot be conceded that any purpose would be served in quantitatively measuring these relationships in the two kinds of groups which have been mentioned. This is because they are accidentally formed groups, lacking a basic purpose and without a pre-appointed leader. Membership of such a group may be interesting, boring or entertaining, but it cannot be said to play any great part in the life-plan of the individual.

A Youth Club aims at being one of the many means by which the individual adolescent boy or girl may form better social adjustments, and become a more complete person. Each member moulds his personality to the structure of such a club in proportion to the character and intensity of its underlying principles and the opportunity offered by activities outside the club. Hence, in such a group as a Youth Club, there is undoubted scope for quantitative tests to be used for research into the ways in which adolescents and adults adjust themselves to adult social relationships. Further reference will be made to this subject in this paper.

When groups of psychotic, latent psychotic and neurotic patients are formed for therapeutic purposes, the therapist must at once notice that his group differs in important ways from the Youth Club just mentioned. Each member of the group has been compelled to withdraw from the social groups of his daily life and from his own consciousness by the severity of his mental conflict. Therefore, the members are much less likely than the average person to be members of any social or recreational group when they first join the therapeutic group. Disorders of personality, failure of emotional adjustment, and a childish state of the social intelligence are additional reasons why the individual may have failed to find a place in any organized group. The therapist may take heart from this, for the very retreat from consciousness

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which has led the patient to the therapist gives to the group, as to the silent monks of the middle ages, a dynamic factor not possessed by, or appreciated by, the so-called normal group.

When we first entered the field of group therapy, three things seemed to us to be of the first importance. They were, (*a*) the criteria of selection for group therapy, (*b*) the technique of group therapy, and (*c*) the assessment of what is happening in the group. These things are still of first importance to us to-day. The type of patient most suitable for group therapy is still under consideration, not only in our own groups, but by all workers in this field. With this, and with the technique of group therapy, we are not here concerned. The assessment of what is happening in the group appeared to us to be essential to any long-term programme of group therapy. No group can remain healthy unless its members are given opportunities to express themselves in action. Since, in therapeutic groups, the leader does not share in the common problems of the group, any valid assessment of the interpersonal relations in the group must be made by members of the group themselves.

Assessments made by the therapist yield valuable information provided the therapist is prepared to accept the disadvantage of making notes whilst the group is meeting. We have been more interested in the assessments made by the members themselves, and have sought a method by which the group could itself record in a simple manner its own structure and internal relationships. Further, we desired to study the changes which took place in group structure over a lapse of time. Finally, we sought to compare the structure of different kinds of psychiatric groups, and to compare these with a non-psychiatric group, i.e. a Youth Club. These terms of reference form the basis of the present study.

J. L. Moreno, who defined the process of acceptance by the individual of his fellow members in a group, may be said to be the father of scientific group therapy. We decided that the individual's choice of other members of the group to share his common practical and emotional activities could be regarded as his acceptance of that individual for the constellations which the chosen activities represented. If the activities covered a reasonably wide range of human activity, we should have a measure of the degree to which a person accepted the whole personality of his choice. If he chooses only certain individuals for certain activities, we can form an opinion about the more outstanding qualities of the person chosen. It may be unnecessary to mention that such a method does not discover the " popular figures " in the group. A popular person may make little contribution to the life of the group. Furthermore, the individual's personal heroes of leadership and culture are not necessarily those with whom he would care to share his problems, for the very reason that he would dislike such a person to know of his own imperfections.

In constructing a practical test of acceptance, we used the tests of Northway and Potashin as a foundation. This test was designed for use by children in the class-room, and the four questions asked each child represented essentially practical situations, in each of which he was asked to state which three children he would best like to share this activity with. By redesigning the test questions to include two practical and two emotional situations, the test has been made

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applicable to the adult situation. The details of the test are described in a later section. The method of assembling the results is that used by Northway. In comparing the results obtained in different groups, we have made use of the statistical work of Bronfenbrenner.

Whereas the careful work of Bronfenbrenner has been strictly adhered to, the conclusions to be drawn from the test present certain differences from those of other workers. We believe that this paper represents the first published work on the systematic study of the structure of adult therapeutic groups.

The Field.

The material for this study has been obtained from three groups: (1) a Social Therapy Club for out-patients, (2) an in-patients' group at a Mental Hospital, and (3) a Youth Club. These groups have certain features in common. All are designed to help their members to a better social adjustment by means of establishing specific relationships between the individual and the group leaders, the individual and the group, and between individuals in the group.

The guidance of the individual towards mental health in its broadest sense is the common aim of all three groups.

Each of the groups studied is part of a larger organization, i.e. the Croydon Mental Health Service, the Mental Hospital associated with that Service, and a Church. The organizations sponsoring the groups by their nature determine two aspects concerning the place of each group in the community. These are, first the relationships between the various groups; and second, the attitude of individuals in the community towards the prospect of joining one of these groups.

As examples of inter-group relationships, we may mention that some groups in the community will actively assist a mental treatment group on the grounds of furthering positive health, whilst others will be prejudiced on the grounds of a traditional attitude towards mental illness. Individual attitudes towards the respective organizations predetermine a person's decision to join the group, and later, whether he shall continue membership. While the sponsors of each group provide a degree of material security, they do not directly intervene in the conduct of its affairs. (In no group was identification with the aims of the larger institution a pre-requisite of membership.)

A more detailed description of these groups will show certain important differences.

Group I: The Out-Patients' Club.

This Club was opened in January, 1947, under the leadership of the writers. Meetings are held once a week, and a Committee of members decides questions of programme and club management.

The programme includes discussions on questions of general interest as well as on psychiatric problems, dramatic and musical evenings, dancing, games, etc. A canteen is staffed by members.

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Recruitment tends to be selective. Patients attending for out-patient treatment and some of those discharged from hospital are invited to join by the leaders.

Information about each member prior to enrolment is obtained from a psychiatric interview and a social and psychiatric history. In the course of his attendance the patient's social problems are noted. Intelligence is tested by Raven's matrices.

Membership and attendance.—The number of active members has remained at about 30 throughout the period covered by this study, and the bulk of the membership has remained constant. The average attendance is 19.

The treatment aim of club membership is openly accepted by each patient in relation to the staff, but despite the club's friendly atmosphere, there is little spontaneous discussion of personal problems among members.

Group II: The In-Patients' Group.

This group has met once a week since November, 1946, for an hour's discussion of psychiatric problems: The writers have used a wide variety of discussion techniques, ranging from free discussion of problems raised by the patients, to discussion illustrated by dramatic acting out of situations, and to the didactic lecture-discussion method. Paintings and drawings have also been used to help towards self-expression. Recruitment for this group tends to be less selective than for Group I. Most patients attend on the invitation of their doctor, but some are brought by friends.

The membership of this group is subject to constant change, as patients attending the group are mostly on the road to recovery. There have therefore been large variations in attendance, ranging from 7 to 16. Male patients tend to be in the majority.

The place of this group is ancillary to the general treatment plan. Patients attending are also, as a rule, under insulin, E.C.T. or analytical treatment.

This group has failed to develop any social structure, although there are a number of practical tasks for which members could usefully take responsibility, such as preparation of the meeting room, acting as secretary, etc. It differs in this respect strikingly from Groups I and III. It is the only one of the groups studied in which movement is almost entirely absent, and in which certain stereotyped features have developed. Men and women tend to sit at opposite sides of the room, and irrespective of the technique used, the members' contributions are nearly always directed to the leaders. Attendance is entirely voluntary, and by the very nature of the group patients come to it largely because they hope to derive from their attendance some information which will enable them to leave the group permanently.

Group III: A Youth Club.

A Church Club consisting of 40 young people aged 14 to 21 was selected as the third group in this study, largely because its programme and method of leadership were similar to that of the O.P. Club described above. Here, too, the man and woman leader leave as much responsibility as possible to

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its members. Recruitment is non-selective apart from the age limits, and the selection which automatically follows from the Club's attachment to a Church.

Membership of this group has remained fairly constant, except for an influx of new members from the lower age groups and the formation of a separate unit for those over 20. The average attendance is 30. Boys and girls attend in approximately equal numbers.

The leaders have little information about the background history or special problems of the members on enrolment. This was the group in which the greatest amount of spontaneous movement coincided with a good deal of self-imposed group discipline. The purpose of the club as a place in which new relationships could be established and old ones enjoyed was consciously acknowledged by members.

The Test.

In the conduct of therapeutic groups systematic observation of inter-personal relationships, and of the individual's relation to the group as a whole, has long been a problem. These two factors which distinguish group treatment from individual psychotherapy have been difficult to assess without disturbing their very operation.

The writers, therefore, felt the need to learn more about the patient's progress in the group derived from observations on social behaviour and participation.

For this purpose we developed a modified form of the Sociometric Test as used by Moreno. The test, as defined by Moreno, consists in the choosing of associates from among group members for one specific activity or situation. As criteria of choice, social roles which were considered basic to life in a group were used.

The following criteria were selected as the four most representative of social roles :

A.—Who would you choose as a companion for your daily routine occupation?

B.—If you had £100 to spend, with whom would you share it?

C.—If you had great joy ahead of you, with whom would you share it?

D.—With whom would you share a loss, i.e. a human sort of loss?

Criteria *A* and *B* were selected as representing work and pleasure aspects of life on a material level in which emotional relationships may or may not be involved. Criteria *C* and *D* aimed directly at revealing potential or actual emotional dependence.

Faced with a wide range of intelligence quotients and great differences in the social background of group members, it seemed desirable to obtain some evidence that these criteria were indeed meaningful to group members in the sense intended.

Members of each group were therefore asked to define the situation they had in mind while making their choices at the end of the series of tests. It was stressed that this was entirely voluntary, and definitions were not obtained from all participants.

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A total of 23 members from all three groups gave definitions:

Criterion A.—Routine work was defined by eight members as taking place in the immediate group setting. Fifteen members defined it as a work situation outside the group.

Criterion B.—Spending £100 was defined by all in terms of a holiday, entertainment or social gaiety.

Criterion C.—A great joy was defined in personal terms by 10 participants in terms of more material situations such as "social gaiety, money, a holiday or games," by 8. This section included some surprising definitions of joy such as: "help in health received from the Club"; "the sharing of a secret," etc.

Criterion D.—All participants defined the sorrow situation in personal terms, e.g. illness or death of a close friend or relative.

Even this small number of definitions shows that the criteria selected are sufficiently flexible to have meaning to the wide range of participants along the lines indicated. Thus abstract concepts such as "great joy" may to some participants be inseparable from concrete pleasure situations such as a

Summary of Scores: *In-Patient Group.*

Date of 1st test, 2 April, 1947.
" 2nd " 5 November, 1947.

	1st Test.	*2nd Test.*
Number of men	5	7
" women	5	2
	(2 walked out before test began)	
Total choices made	28	59
Number of in-group choices	5	37
" staff choices	10	2
" choices to patients' families	5	10
" choices to patients outside the group	8	10
Total out-group choices	13	20
Men-men choices in group	2	34
Women-women choices in group	1	—
Men-women choices in group	—	2
Women-men choices in group	2	1
Number failing to do test	5	1
	(including 2 who left room)	
Average score	0·5	4·6
Highest score	2	12 (male).
Number of isolates	3	1 (lowest score, *nil*).
Total possible number of choices	120	108

Note.—No statistically accurate estimates of acceptance or group structure can be obtained from the first test because of the small number of in-group choices.

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holiday. Equally some individuals choose associates for the work situation only in terms of work in the group, while for others the choice has validity for situations outside group life. It is probable that definitions of choice situations would change in relation to the individual's adjustment to the group, and to his personal development. There is much scope here for further research in this field.

Test technique.—The test was preceded on each occasion by an explanatory talk. Each subject was given a card (as illustrated) and asked to make 3 choices for each situation. Subjects were asked to choose in-group members where possible. If they felt compelled to choose out-group members or staff, they were told that they could do so.

Conclusions Reached by Study of In-Patient Group.

The first test showed that group cohesion and group structure were absent. The emotional tension roused in the group was such that one patient, a schizophrenic girl, left while the test was being explained. She said afterwards that she did not leave because of any feeling of anger, but because of the unpleasant associations aroused when the third situation was mentioned. Her friend, a tense psychoneurotic girl, left also in sympathy with her. Immediately after this a male schizophrenic patient said that he regarded the test as a gross infringement on his personal life, but he did not leave the room although he would not participate in the test. The therapist felt at this point as if he had entered a crowded railway compartment, and attempted to carry out a similar test. The situation looked like ending in the complete break-up of the group. The day was saved by an epileptic who said that it was obviously up to members of the group to support the therapist and to assist in treatment. After this the test proceeded smoothly, although the results clearly revealed the causes of such an unpromising reaction to the test. The conclusions drawn from this test may be summarized as follows:

(*a*) This was a young group, unaccustomed to the tradition of group therapy.

(*b*) The members had not had much opportunity for intimate social contact.

(*c*) Individual members were not accustomed to describing personal feelings in the presence of others. At that stage, group behaviour was not being analysed by the therapist.

(*d*) The relatively high percentage of staff choices was divided among three doctors, one social worker and the chaplain. Hence it could not be said that the members of the group felt any special dependence towards the therapist.

The second test revealed a greater degree of group cohesion, although the almost complete absence of inter-sex choices was not a good sign. Only one member of the group failed to participate. One third of the choices went outside the group. Although this second test was carried out in what was traditionally the same group, none of the members present at the first test was present at the second. This was because all the members present on the first occasion had left hospital except the two who had walked out of the room during the first test.

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The second test revealed the necessity for members to know each other socially. The common basis of neurosis or psychosis does not breed acceptance, and as a result of this test it was decided that the group should meet together for an additional hour a week on a purely social basis. One feels that the

Out-Patient Group.

Date of 1st test, 25 February, 1947.
,, 2nd ,, 17 June, 1947.
,, 3rd ,, 4 November, 1947.

	1st Test.	*2nd Test.*	*3rd Test.*
Number of men	5	7	9
,, women	9	11	10
Total choices made	132	185	177
Number of in-group choices	84	119	121
,, staff choices	36	48	41
,, choices to patient's family	2	6	1
,, choices to patients outside group	10	9	11
,, choices to friends outside group	*Nil*	3	3
Total out-group choices	14	18	15
Men-men choices in group	20	16	23
Women-women choices in group	44	66	43
Men-women choices in group	10	27	21
Women-men choices in group	10	10	34
Number failing to do test	*Nil*	1 (male)	2 (men)
Average score	6·0	6·7	6·3
Highest score	11	16	15
Number of isolates (no score)	*Nil*	3	*Nil*
Total possible score	168	216	228

Notes on table (*O.P. Group*).

(*a*) The discrepancy between "Total choices made" and "Total possible score" occurs because members did not all complete the cards.

(*b*) Two out-group choices in the 1st test were made to another psychiatrist and P.S.W. respectively and are not included in the analysis of the out-group choices.

(*c*) In the 2nd and 3rd tests one of the patients failing to perform the test was an intelligent man aged 24 years (Matrices test Grade II). He suffered from an inability to visualize proper names into their written equivalents. It was thought better not to embarrass him by helping him to write down his choices in front of the other patients. The other patient failing to write anything in the 3rd test was a schizophrenic who was not well at the time, his condition having recently deteriorated. He was becoming more isolated and less contributory to Club affairs. It is noteworthy that the test revealed an impending breakdown of all social contacts of a more severe nature than might have been apparent by ordinary observation, and it is probable that this patient will have to return to hospital again fairly soon.

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Specimen of Scoring Card.

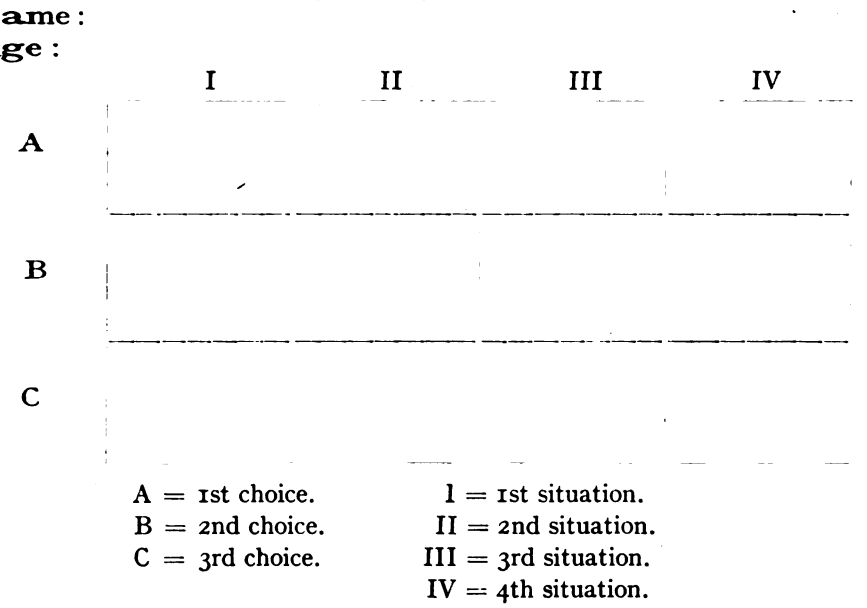

FIG. 1.

isolation and preoccupation of the psychotic at the hospital stage of treatment is such that group therapy must depend for group cohesion on the common factor of mental illness rather than on any well-marked interpersonal relationship. The first test showed that each member lacked any real relationship either to his fellow members, the group as a whole or the staff. In the second test relationships to the group as a whole were considerably strengthened, but interpersonal relationships and dependence on the therapist were still weak. Whilst in hospital the patient identifies the therapist with the whole hospital, whilst as an out-patient he shows his dependence on the therapist alone very strongly, as will be seen later.

CONCLUSIONS REACHED BY STUDY OF OUT-PATIENT GROUP.

Three tests were carried out with the out-patient club. The first of these was done when the club had been established about two months. The 2nd test was done four months after the first, and the 3rd test five months after the second. Between the 2nd and 3rd tests the club had been closed for a month during August.

All these tests proceeded smoothly and without any personal disturbance. By the time the 3rd test was carried out, it had been welcomed by most members as part of the treatment plan. Study of the table reveals a fair degree of constancy in all three tests. Making a basic assumption that individuals should be expected to make progress through the medium of a social club, this result may seem at first to be disappointing. An analysis of this kind, however, reveals only information about the structure of the

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group in which the individual is placed. A study of the sociograms shows that individuals do in fact progress during their stay in the club, and many achieve increasing acceptance by their fellows, and take on positions of responsibility. The membership changes considerably, and it is of great importance to note that, with many new members participating for the first time in the 2nd and 3rd tests, the sociometric structure of the group remains almost unaltered.

The following specific conclusions about group structure can be drawn from the sociograms.

1. The ratio of in to out group choices is higher than for the in-patient group, but not so high as for the Youth Club.

2 Dependence on the staff is high and remains consistently so. Most of the staff choices were made on the emotional situations. As previously noted, staff dependence is not marked for the in-patient group, but this seems to depend on the patient achieving his main transference to the whole hospital. In the social therapy club dependence on the therapist and social worker takes the place of this; by the date of the 3rd test the general indications were that the club members were becoming more self dependent, and looking more to the committee members for support and encouragement. The test reveals, however, an almost constant dependence on staff, and it appears that this state of affairs is related to unconscious mechanisms. It teaches us also that it will probably not be possible for members to transfer to another club unless they can either lose this dependence or else be fortunate enough to select a lay social club where such dependence is possible.

3. A small number of "mother figures": older women of the maternal temperament attracted a significant number of choices, but it cannot be said that this was a striking feature of the test results.

4. Intersex choices were the most "normal" feature of the scores. They corresponded closely in distribution to those found in the Youth Club.

5. Study of the sociograms will readily reveal the existence of "cliques," should these be present. Such a type of grouping was only apparent in the 3rd test, and was related to a hysterical self-centred woman who depended for her mental support on collecting around her and caring for a number of psychotics, mostly of low intelligence. She would bring these to the club from time to time, but they usually proved failures in the club setting and left. On this occasion her "group" consisted of (*a*) a dependent inadequate hysterical man of 26 with a bad home background, who had never earned his own living, (*b*) a mentally defective girl with an I.Q. of 52 who had only recently left hospital, (*c*) a schizophrenic of high I.Q. who had left hospital against advice and who was unstable and non-contributory. Two other schizophrenic patients of lower I.Q. than the majority of the club associated themselves with this group. The separation of this group of six patients from the remainder of the club had been noticed for a few weeks and had been causing us some anxiety. The mentally defective girl only came on that occasion, and was advised not to come again. The two schizophrenics will probably have to return to hospital within the next few months.

6. *Correlation between acceptance score and social status.*—This has been worked out for the 3rd test only. The raw scores of acceptance were cor-

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	Miss L—.	Miss H—.	Miss J—.	Miss C—.	Miss K—.	Miss Ly—.	Miss S—.	Mrs. T—.	Miss P—.	Miss Q—.	Mrs. G—.	C. J—.	P. E—.	R. B—.	R. Br—.	L. L—.	R. G—.	T. G—.	Psychiatric Social Worker.	Psychiatrist.	Out Group. Miss N—.	Miss M—.	Miss D—.	Others.
Miss L—	..	..	..	..	IIII	IOOO	..	OIII	..	..	..	..	..	IOII	OIOO	..	..	..	..	..	..	..	..	..
Miss H—	..	..	IIIO	IIII	..	IIOI	..	..	..	..	..	..	..	..	..	..	..	..	OOII	..	..	..	..	..
Miss J—	..	..	IIII	IIII	..	..	..	..	..	..	..	..	..	..	..	..	..	..	IIII	..	..	..	..	..
Miss C—	..	..	IIII	IIOI	..	..	..	..	..	..	..	OOIO	..	..	..	..	..	..	OIII	..	..	..	..	..
Miss K—	IIOO	..	..	..	..	..	OIOO	..	..	..	..	..	..	OIOO	..	..	..	..	..	..	..	..	..	..
Miss Ly—	IOII	..	..	..	..	..	IIOO	..	OIOO	..	..	..	..	..	..	..	..	..	IOII	OOII	OIOO	..	..	..
Miss S—	..	..	..	..	..	IOII	..	IIOO	..	..	OIIO	..	..	..	..	..	..	..	IIIO	OOOI	..	..	..	..
Mrs. T—	OIOO	..	..	..	OOIO	..	IOII	..	OIOO	IOOO	..	..	..	OIOO	..	..	..	..	IOOI	OIOI	OOIO	..	..	..
Miss P—	..	..	..	..	..	..	..	OIIO	..	OIOO	..	..	..	..	..	..	..	..	IOII	OIOI	IOOO	IOII	..	..
Miss Q—	OOIO	..	..	..	OIOO	IOOO	IOOO	OOOI	OOIO	..	..	..	..	..	..	..	OOOI	..	IIIO	..	..	..	..	..
Mrs. G—	..	..	..	..	..	..	..	IOOO	..	..	..	OIOO	..	..	IOOO	..	..	..	OOIO	OOOI	..	..	..	Seven
C. J—	OIIO	..	IOII	..	..	..	..	..	..	..	..	..	IIII	..	..	..	..	..	..	..	..	..	IOII	..
P. E—	..	..	IOOI	..	..	..	..	..	..	..	..	IIIO	..	..	..	..	..	..	OOOI	IOII	..	..	..	..
R. B—	OIOO	..	..	..	OIIO	..	..	..	..	..	..	..	..	..	..	..	..	..	IIII	IOII	..	..	..	Two
R. Br—	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
L. L—	..	..	..	..	..	OIOO	..	..	..	IOII	..	OOIO	IOIO	IOOI	..	..	..	..	..	OIOI	..	..	..	..
R. G—	..	..	..	..	IOIO	..	OIOO	OOOI	OIOI	IIIO	..	IOOO	OIIO	OOOI	..	..	..	..	..	..	..	..	..	..
T. G—	..	..	..	..	..	..	..	..	..	..	IIII	..	..	..	..	..	..	..	IOOO	IOOI	..	..	..	..
A + B and C + D	6–4	0–0	8–8	6–5	5–5	6–3	5–2	6–5	3–2	5–3	3–3	4–3	4–4	4–4	2–0	0–0	0–1	0–0	13–17	6–12	Total	out-group = 18.		choices
Total choices made	10	0	16	11	10	9	7	11	5	8	6	7	8	8	2	0	1	0	30	18	18			

Example of scoring :—IIII = Choices made to a person for each of situations *A*, *B*, *C* and *D* respectively.
Out-patient Club :—Date, 17 June, 1947 (2nd Test).

FIG. 2.—*Sociogram made from the Second Sociometric Test at the Out-Patient Club.*

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related with I.Q. (Raven's scale), length of membership corrected to a maximum of five units and membership on the committee, scoring 5 for re-election, 2·5 for a single term of office, and *nil* for non-election. These are arbitrary figures, and were chosen so that all the scores for social status lay between 0 and 5. For the intelligence scores, persons in group V scored 0; those in Group IV scored 1; in Group III −, 2; in Group III +, 3; in Group II, 4; and in Group I, 5. When this was worked out there was a correlation coefficient of + 0·61, which indicates a significant relationship between acceptance in the situations set and intelligence and social status in the group.

7. *Correlation between acceptance score and voting score at a committee election.* —Two weeks before the 3rd test was carried out there was an election for four vacancies on the committee. There were six candidates. Each member of the club, 18 being present, was allowed four votes and self choices were not permitted, although one member did nevertheless choose himself. The results were as follows:

Initials.	*Voting.*	*Acceptance score.*
F. P—	13	14
R. B—	11	5
Miss B—	10	5
Mrs. C—	9	4
Miss L—	8	9
Miss M—	5	0

The correlation in this case is + 0·75, which may be regarded as significant.

Youth Club.

Date of 1st test, 30 April, 1947.
„ 2nd „ 15 October, 1947.

	1st Test.	*2nd Test.*
Number of boys	14	17
„ girls	16	21
Total choices made	338	449
Number of in-group choices	244	384
„ staff choices	20	13
„ choices to family	*Nil*	*Nil*
„ choices to friends outside group	6	1
„ choices to club members outside group	68	51
Total out-group choices	74	52
Boy-boy choices in group	66	101
Girl-girl choices in group	84	148
Boy-girl choices in group	58	82
Girl-boy choices in group	36	53
Number failing to do test	*Nil*	*Nil*
Average score	8·0	10·0
Highest score	27	32
Number of isolates (no score)	2	1

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Conclusions Reached by a Study of the Youth Club.

The main features of the results obtained from testing the Youth Club were lack of rigidity and self dependence. Lack of rigidity is revealed in several interesting ways. Although several of the most fully accepted members of the club remained so for both tests, the people who chose them varied from one occasion to the next. The Committee received comparatively scant acceptance. Some Committee members were not chosen at all. We did not think that this revealed an unhealthy situation in the club. On the contrary, the rigid conformity to selecting an elected Committee member for the situations by the out-patient group may be compared unfavourably to the choosing of personal friends which we found in the Youth Club. The number of staff choices was low, and those made were mostly on the emotional side. The number of in-group choices was high, and the intersex choices were distributed in a way consistent with the social behaviour of adolescent boys and girls.

Discussion with the leaders after each test revealed some information about two or three cards which showed abnormal responses. We concluded that these were cases of mild adolescent instability, and that their numbers were not excessive. Among so-called " normal " clubs and groups, one may say that the less pure and the more heretical are its aims, so do larger numbers of unstable, potentially or actually neurotic people join its ranks. Thus, the low number of abnormal responses in this club indicated a high degree of mental and spiritual health.

Summary of Results.

The tests used reveal the following essential structure in the three groups tested :

In-patient Group.

(*a*) The relationship of the individual to the group is poor.

(*b*) Inter-personal relations are almost absent.

(*c*) Dependence on staff is directed to the hospital as a whole rather than to the therapist.

Out-patient Group.

(*a*) Specific group feeling exists, and the individual shows moderate dependence on the group. This relationship is rigid, and a high positive correlation exists between acceptance and the members' specific function in the group.

(*b*) Inter-personal relations are moderately good, but are rigid in form.

(*c*) Dependence on the staff is well marked.

Youth Club.

(*a*) The group and interpersonal relations are good, flexible, and based on normal health, good feeling, and a common mental and spiritual aim.

(*b*) Dependence on the staff is not great.

(*c*) Abnormal responses were few in number.

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Discussion on the Possibilities of Further Statistical Analysis of the Results of the Tests.

The work of Bronfenbrenner was directed towards the computation of what he calls "social status indices." The essential purpose of the series of calculations which he carried out is to discover which scores of acceptance are significantly high and which are significantly low. When the raw scores are plotted against their frequency of occurrence the resulting histiogram shows some skewness in every case, due to differences between the mode and the average of these occurrences within the group. Thus the probability of chance occurrence for any particular number of choices received can be calculated. Thus it is possible to compare the significance of changes in score received by an individual over two or more tests; when the number of members in the group varies from test to test in practice, it nearly always does. As this paper is limited to a discussion on group structure and the interpersonal relations in groups, such an assessment hardly comes within the terms of reference of this paper. The discussion is important, however, as therapists may consider using this test to make long-term individual studies on social therapy clubs or Youth Clubs. If this is to be done, it is essential to have a constant frame of reference when comparing groups of different sizes. Where such statistical work is required, Bronfenbrenner's arguments for the use of the Type III function for approximating the expanded binomial appear strong and well founded.

Summary and Conclusions.

1. A modification of Moreno's sociometric test has been devised for the study of adult groups.

2. Two groups of patients consisting of those suffering from latent or active mental illness and of those recently recovered from such illness were given the test. Tests were also carried out on a Youth Club, which was used as a control.

3. The test was used specifically to examine the relationship of the members to the group, and the interpersonal relations of individual members of the group.

4. The test situations were devised empirically to cover as wide a range of human activity as possible. While we do not claim to have found fully representative situations, the patients' own conception of the situation in terms of a specific activity (for example, going for a holiday) is the true measure of the broad function of the situation. Further research by this method may give us the basis for some standardization of the test situations.

5. The results of the tests show constant and rigid patterns of relationship in the therapy groups, compared with individuality and flexibility in the control group.

6. The possibilities of using the test to study the growth of interpersonal relations are discussed. We have concluded that statistical care is necessary if such a study is to have validity.

7. This test may prove of value to Youth Club leaders as well as to group therapists. It should, however, be pointed out that the difficulties of inter-

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pretation are considerable. In the present state of our knowledge of sociometrics, it would appear desirable that the tests should only be carried out with the co-operation of someone experienced in this technique.

We are indebted to Dr. T. P. Rees, Medical Superintendent of Warlingham Park Hospital, for permission to publish this report. We should also like to record our thanks to Mr. Rae, secretary of the Croydon Youth Clubs, for his co-operation, advice and help in placing the records of no less than 46 Youth Clubs at our disposal. Our thanks are also due to the friendly help of the leaders of the Youth Club selected.

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THE APPLICATION OF PSYCHOANALYTICAL PRINCIPLES TO HOSPITAL IN-PATIENTS.*

By JOHN RICKMAN, M.D.

WE are met to consider the application of psychoanalytical principles to hospital in-patients. Before we consider the applications it would be well to consider briefly, and have some agreement on, what those principles are.

First, the whole fifty years of psychoanalytical experience shows that one cannot separate research from therapy in this field of work. The technical aim of the therapy is to enable the patient to disclose as fully and as freely as possible the history of his development, including not least that of which he has been unconscious. This disclosure the doctor must meet with sincerity of purpose and dispassionateness, and he must not lose patience in the face of failure. These qualities are among those which are prerequisites in the research worker. The discovery of the causes and the solving of the problems of mental pain are not possible unless the patient experiences relief of that suffering in the course of his treatment; then he will co-operate in the research and in the therapy. This can be briefly summarized by saying "No research without therapy; no therapy without research," i.e., the patient's personal and particular difficulty has to be the subject of a special and personal investigation, personal both to the patient and to the doctor treating him.

The second point is that there is invariably a strong but unconscious defence set up against the resurgence of the past emotionally-toned experiences, and these defence processes operate both in the patient and in the doctor treating him; if the latter has not worked through his own past experience he will unwittingly co-operate with the patient's defences in greater or lesser degree, and this will nullify both the investigating process and the concomitant therapy. This work cannot be learnt from a book; it is a piece of living, i.e., an always changing experience.

The third point is that invariably there is disclosed a disturbance in those aspects of the patient's object relationships which in the widest sense we can call sexual and which, again, are unconscious. The kind of object relationship thus disclosed originates in infancy, and tends towards behaviour which is incompatible with the ordinary adult or conscious or social relationships.

The fourth is the most important of all for our present discussion. It is invariably found that the patient's behaviour is determined by two classes of tendency: the one is to adjust to his present environment (of this he is usually conscious), the other is to use the present situation to work through uncompleted emotional experiences of the past (of these he is invariably

* A contribution to a Symposium at the Royal Society of Medicine [Section of Psychiatry] 9 March, 1948.

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unconscious); these two tendencies operate simultaneously. The aim of the psychoanalytical procedure is to discover and to facilitate the patient's re-experiencing these uncompleted and unconscious emotional situations in the relation existing between patient and physician and make them conscious. It is a new kind of social relationship which Freud devised and called the "transference situation," which is at once the instrument of research and of therapy. A therapy which does *not* give the development of this transference situation the highest priority (and the working out of present findings in it in terms of the patient's past experience by free associations) is by that much not using psychoanalytical principles, i.e. the measure of "psychoanalytic-ness" of a therapy depends on the degree of priority given to this process.

Now I have gone into these preliminary details, which after all are well known, because something important must be said which is not so widely realized; these are positive statements about what occurs in psychoanalytic treatment, not about what must not occur. There is nothing in all this that is incompatible with the exhibition of sedatives, shock-therapy, surgical interference with the brain or other organs, not even with the restriction of social locomotion (certification). Any or all of these things are compatible with psychoanalytical therapy of the patient *provided*—this is a most important provision, particularly, most particularly, for the analyst—provided that every event is referred back to this peculiar kind of social relationship called the transference.

The more that the analyst discloses his own opinions or personality, the more difficult is it for him and the patient to discern what is transferred from the unconscious into the situation. For this reason the analyst and patient do not meet socially, nor does the analyst give advice. Further, it is a relation between two people. In out-patient analysis this is possible.

With in-patient psychoanalytic treatment there are complications because more than one doctor comes simultaneously into the doctor-patient relationship; from a two-body it becomes a multi-body situation; for example, the Medical Superintendent, the House Physician and the analyst *vis-à-vis* the patient. How does this affect the application of psychoanalytical principles? In essentials not at all, it only makes the unravelling of the transference phenomena more difficult. The role ascribed to each of these persons in the patient's current phantasy life has to be discerned separately and with their interconnections and interpreted to the patient. This is more difficult for the analyst than in the usual out-patient treatment, because with in-patient work these other doctors are in fact playing a social role in the analyst's as well as the patient's life. So both parties to the analytical relationship have more to cope with, but the principles of the work can be applied just the same.

We could summarize what I have said so far almost in three words: the work of analysis is essentially—like all scientific work—a-historical. True we deal with the reconstructions of the patient's past, but we see them "here and now" (the three words) in the present, here before us in the transference situation, now. It is the discovery of *all* the ingredients in the "here and now" on the part of patient and analyst which constitutes the essence of this work. Its success depends on the power to concentrate on the details and their

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inter-relations in the " here and now " " There is no middle position " as an aphorist said, " between the ' here and now ' and the ' cut and dried '."

Before I conclude I want to add one word about co-operation between analyst and other doctors who are also involved in the medical care of the case. Such co-operation is not easy because in the transference situation itself the other doctors can play no direct part ; frustrated curiosity is always hard to bear. But when the patient (as may well happen) plays one doctor off against another the situation is apt to be exasperating. In the long run this usually rights itself if the doctors concerned can see the value of referring, and letting be referred back, everything that occurs to the cardinal situation of psychoanalytical research and therapy—the transference situation. What really counts is not where the work is done, but how thoroughly the essential principles are grasped and what priority they are given.

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APPLICATION OF PSYCHOANALYTIC PRINCIPLES TO THE TREATMENT OF IN-PATIENTS IN MENTAL HOSPITALS.*

By W. CLIFFORD M. SCOTT, B.Sc., M.D., D.P.M.

THIS paper has been written with the intention of illustrating the application of psychoanalytic principles to the treatment of in-patient psychotics by reporting the treatment of a female manic-depressive patient by psychoanalysis at the Cassel Hospital during 1936–38. Unfortunately no reports of intensive in-patient psychotherapy of psychoses in this country have been published. Little prolonged intensive psychotherapy of psychoses has been carried out in hospitals, apart from the Cassel Hospital, where for many years the staff was sufficiently numerous to allow most patients to have daily interviews of significant length. In the United States experimentation has been much more active. Recently Fromm-Reichmann (1947) has reviewed many of the problems encountered in the several Mental Hospitals where psychoanalytic methods of treatment are actively pursued. Rosen has reported daring and courageous experiments. He has reported (1946) the treatment of acute catatonic excitements by psychoanalysis—his chief innovation being the long interview. With one patient the first interview was 16 hours with a break of half an hour. He has reported (1947) favourable results from treating 38 male and female schizophrenic patients, the ages of the patients ranging from 15–49, the duration of illness before treatment ranging from 1 month to 27 years, and the duration of hospital residence ranging up to 11 years. The average daily hours of treatment ranged from 1 to 12, and the duration of treatment ranged from 3 days to 11 months. In my opinion the New York Psychiatric Institute which encouraged Rosen's experiments has fostered a technique about which much more will be heard.

The literature contains no reports of patients treated psychoanalytically in hospital with which I can compare the material I am reporting. Kaufman (1937) reported the successful treatment in hospital of two late-life manic-depressive depressions by psychoanalysis, but the technical problems dealt with by him differed greatly from those encountered by me.

My patient was 20 when treatment began in 1936. She was a first child, and was breast-fed for about one month. She sucked strongly, but obtained little, and often screamed herself to sleep. Owing to this she was weaned to the bottle, which she sucked well. The screaming ceased. At the age of 6 or 7 months she spoke a few words, and before 2 years was using complicated words and sentences. Her bowel and bladder were trained quickly and early. Solid foods were refused for some time, and she remained difficult about solid food for several years. By about 15 months she was weaned from the bottle to semi-solids. She put no toys to her mouth. Her further development was uneventful. A sister was born

* Slightly elaborated from a paper read on 9 March, 1948, at a Symposium on "Application of Psychoanalytical Principles to the Hospital In-patient" at the Royal Society of Medicine (Psychiatric Section), London.

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when she was a toddler, and two brothers were born later. At 10 she had whooping-cough and mumps, and her tonsils were removed. At 11 she had measles and bronchitis. Her menses began at 16. No emotional reaction or change in her personality were observed in regard to any of these events. She progressed steadily through school, but was never considered to be doing her best. After finishing secondary school she went to College, both her parents having had a similar education. At college she met a woman whom she admired and to whom she wrote letters. This friend noticed that she was becoming more tense and depressed, and suggested that she should go to the Institute of Industrial Psychology for advice regarding the type of occupation which would most probably suit her. She was told that tests done there showed her to be of exceptionally high intelligence, and she was advised to seek medical treatment for her emotional state. The late R. D. Gillespie, whom she consulted, considered that she was on the verge of a serious depression, and advised treatment at the Cassel Hospital.

Her disposition had always been sociable with her family, but she was shy with new acquaintances, especially men. She never discussed her feelings, and under no circumstances showed any intense emotion. Until her going to college, piano playing had been a great interest. She gave it up because she felt she was not making any progress. During the few months preceding the beginning of treatment she helped at home while her mother was convalescing from the effects of an operation.

On admission to hospital she was tense and fidgety. She seemed to be continually on the verge of tears, but wore a forced smile. She did not speak much, and when talking spoke slowly and in a low voice. She complained of being fed up and of not knowing what to do. On being questioned she said that depression had been increasing for as long as she could remember and that, during the previous few years, depression had been worse. She stated that twice during the previous year she had seriously contemplated suicide by poisoning. Her physical condition was generally good. Her weight had decreased considerably during the previous year.

It was considered justifiable to attempt psychoanalysis as an experiment. During the progress of the analysis the following marked changes in interviews and in her adjustment to the hospital situation occurred. During the first weeks of treatment she was usually silent. During the next months she was almost absolutely silent; and during analytic interviews and for some time after interviews an anergic stuporous state and abnormal sleepiness occurred. Her occasional slight movements furnished material which allowed the analysis to progress. After about seven months' treatment emotional outbursts began to occur—at first at the end of interviews and later during interviews. At first these outbursts were "convulsive" and vaguely directed, and the type of affect was difficult to recognize. At times it appeared to me as if she were going to have a *grand-mal* convulsion. Such spells, which at first began at the end of interviews, lasted up to forty minutes, making it necessary for me to remain with her until she was able to leave the room without much difficulty. She had to be held at times, and the help of two nurses was required, owing to her strength.

Later the emotional outbursts were more definitely either of anger or of love. At this time she was more sociable in the hospital, and became friendly with a younger girl. She began to write letters, and these she brought with her to interviews. Later she brought drawings. At a later stage she was openly depressed and suicidal, and she cried during interviews. At other times her behaviour was excited and playful in a flighty, manic manner. She began to be more active outside analysis and became both more guilty and more actively a nuisance, attempting for a time to make the analysis impossible. She tried to interfere with the treatment given by me to other patients. Still later yelling and screaming accompanied her emotional outbursts, and she began to talk more during interviews. Following this her emotional outbursts became less frequent and less intense. She became more friendly with her family when she went home on visits. A friendship with an older man began, and later she became friendly with several young men of her own age. She secretly depreciated these men. Jealousy became more openly apparent. She began to show more interest in her personal appearance. She commenced making plans for the future, and was more guilty about the real hardship her treatment was causing her family. She decided to discontinue treatment and to start training as a secretary.

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There was marked improvement in every way, including her sexuality. Masturbation had been first described in a letter written after about nine months' treatment. She wrote that she had tied herself up so that on moving she was hurt. She imagined she had a penis attached to herself and was having intercourse with a woman. During the second year of treatment the need to feel pain during masturbation gradually disappeared. Her activities became predominantly feminine. Her masturbation phantasies were then of normal intercourse and included phantasies of pregnancy. She began to think of most men as potential husbands.

The following sketches of important aspects of the analysis will illustrate the content of some of the problems such an analysis presents. Interviews were daily and lasted one hour. For several weeks interviews were prolonged to two hours, as I remained with her until the intense emotion which had begun during the interview ceased.

It was three weeks after treatment began before she was able to lie on the couch. The interpretations of the scanty material obtained during this period allowed the analysis to begin. From work with this and other similar patients I have come to believe that in psychoses, content, which may at first sight seem to be conscious, or at least preconscious, is often deeply unconscious. After more than a year's treatment I became convinced that the behaviour, which had been used as material on which to base interpretations during the first weeks, had been deeply unconscious.

She sat tensely and mostly silently, stating that she was afraid of what I would think if she spoke. I said that she was afraid that I would say something frightening such as had been said to her by others in her life. She said that she felt dead. I said that she wanted me to make her feel alive and not to frighten her as others had. She said she felt inferior. I said that she wanted me to help her lose this inferior feeling. She then caressed her leg and smiled. I said she wished to show me, but was afraid to tell me, that she was pleased. She told me she wanted to scream where I could not see her. I interpreted this as anger at her frustrated desire to show more pleasure than she had shown me by stroking her leg and smiling. I said she was angry partly because I asked her to put all she was conscious of into words, and partly because I had not shown pleasure at the way she showed me her pleasure—namely, by smiling and stroking her leg. I said that she wanted to protect me and herself from all she thought would happen if she screamed at me while she was watching me and I was watching her. She then began to stroke her legs quite tenderly.

She told me a dream:

> "Mother was dead and I had to care for the house. I was to have come here in a day or so. I wanted a husband and a baby, but I couldn't care for the food."

She gave no associations. She was silent and, after a time, asked me not to look at her. I connected the dream thought "I couldn't care for the food" with her difficulty in dealing with the analysis. I informed her that her difficulty in speaking and her wish neither to be watched nor to be heard screaming by me arose because she felt she could only say or show me something bad—something which she thought would make me act to her as others had acted when they had seen her do what she wanted to do or say what she wanted to say. She then became less tense, stretched, yawned and looked sleepy, and turned to the couch. I said that she had decided to sit instead of to lie, being afraid of what would happen if she lay and slept, and therefore could not watch me in order to protect herself. She then got up from her chair and lay down on the couch.

The analysis had begun by using not only the sequence of what she had said, but also by using the few movements and expressions of emotions she had shown. This appears to me to be similar to the minute attention paid in child analysis to the details and the sequence of the child's behaviour as a whole. In fact the work of those who started analysis of infants and children has in my opinion given the most important single impetus to new psycho-analytic work with severe psychoses.

A description will now be given of some aspects of the analysis of the stupor. Soon after beginning to lie on the couch she began to talk less, and finally only rarely spoke to me for several months. She lay motionless and her expression was blank. It was often impossible to know whether she was asleep or not. All

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movements were very slow. After some weeks she began to touch a small rip in the upholstery of the couch near her left shoulder. I was sitting at her left. She touched the rip—she tucked its edges in, making the hole larger—she folded the edges together, making the hole seem to disappear, and at times she would leave it alone and roll over on her side to her right. Once after touching the edges of the rip and putting her finger in it she suddenly pulled her skirt down as far as it would go and lay on her back. I interpreted this as anxiety about masturbation. I said she seemed to feel that I would stop her masturbating, just as something within her had stopped her playing with the couch. I interpreted her shift to the genital pleasures of masturbation as a defence against the oral anxieties with which she had started the analysis. She became more active with the hole in the couch, but also generally weaker and slower; and she looked much sleepier at the end of interviews. She continued to be stuporous for some hours after interviews.

The next phase began when she suddenly arose and stuffed some paper into a window which was rattling in the wind. She did this energetically, and seemed to rouse suddenly from a stuporous sleepy state to do so. On lying down she returned to her former state. I told her that this strong reaction to a noise was to prevent it from harming either me or herself in the way which she thought the noises she was keeping in would harm either or both of us if she gave up the defensive weakness and sleepy silence. At the end of the interview she silently and vaguely clutched me, and strong convulsive movements developed. I thought that she was going to develop a *grand mal* convulsion. She seemed to be fighting with herself to hold something in. Her eyes and mouth were tightly closed. She eventually became weak and was shortly able to leave the room. I interpreted her behaviour as showing the contrast between her sleepy, stuporous state of anxiety at my being harmed and my harming her in revenge on the one hand, and her intense anger at my not giving her the help she wanted to ask for on the other hand. I related this to the early period when she felt her parents knew her wishes, although she had not spoken. This phase was followed by her bringing me a letter. In it she blamed me for making her want a husband and a baby. I linked this to the first dream she reported, and said that she was substituting me for her earlier acquaintances through whom she had first known of husbands and babies.

She then wrote of the fear she had had of the way her father had hugged her and kissed her. I said that she had also blamed her father for her wish for a husband and baby, just as she had blamed me for the content of the dream she had told me.

She then yelled loudly:

"I can't speak."
"You make me talk."
"I don't dare speak."

I said these were memories of what she had said when angry and memories of phantasies of talking when frustrated; for example, when her father wanted her to talk instead of act and when, during the analytic treatment, I wanted her to talk. A dream followed: "I vomited out of a window and was afraid you would touch it." This was linked to the mess that she had told me she was in (which she wanted me to clear up), to the noise she wished to expel (the window in the dream was the window where she had stopped the noise), and to her fear that I, as a useful external person, and the bad internal mess of vomitus would unite.

Her emotional outbursts then became much less vaguely directed and convulsive. They appeared more definitely as attacks of anger, in which she growled, scratched, kicked and bit. The analysis of the details of this behaviour convinced her that in her phantasies vomitus represented the me which she believed she had eaten in the first seemingly vaguely directed convulsive attacks. The wish to eat me now (since I frustrated her as her parents had in the past) became connected with much memory material—both of fact and of phantasy—concerning her parents and also her grandparents.

She became obsessed with the feeling that there was a lump of meat in her throat and, for a time, she was nauseated and was unable to eat much. These feelings became associated with memories of her bottle and memories of her father giving her the bottle. The emotional attacks became less simply attacks of anger and became mixed with love. She energetically tried to bite me in the genital

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region and, when prevented, she tried to bite me wherever her mouth happened to be. This biting was more than an attempt to bite a bit off my body. She stated and wrote that she wanted to eat her way into my body. This behaviour was interpreted as a desire to swallow and control, mixed with or followed by a wish to eat her way into the person attacked and to be eaten by the person attacked in order to preserve this person from being destroyed by her.

Shortly after this she began to write letters about her masturbation and to draw scenes of masturbation. She described a series of women she had secretly admired. As soon as the interpretation was given to her that she wished to control my sexual behaviour from within me, as she had previously tried to control her father's sexual behaviour with her mother, the masculine identification, which had been brought about both by oral incorporation and by trying to eat her way into me lessened. These different attitudes, which had each led to a masculine identification, were seen at the same time. Phantasies of having sucked, bitten and swallowed her father's penis, and of having eaten her way into him and of having been eaten or swallowed by him, all led to a masculine identification—in the first case due to being controlled from within by the man she had taken in, and in the second case by controlling the man she imagined she lived within. She then became able to describe considerable guilt regarding her attitude to several women. It now became possible to link her previous actual indifference to her mother and father to her anxieties about and her denial of her phantasied control over their mutual behaviour to each other.

Her wish to restore to other women what she had taken from them was first seen in a change in the emotional outbursts. She now became more gentle and tender. At first it was seen as a wish to be loving to a man, so that he could be loving to another woman. It was only much later that this was understood in terms of feminine wishes or of a feminine identification.

Up to this period there was little indication of improvement in her everyday life, and several of my non-analytic colleagues thought that her reactions furnished an example of analysis worsening a psychosis. My judgment was, however, that the changes in her clinical state were clearly related to a transference situation in the analysis, which was gradually becoming more conscious and was gradually altering. In my opinion she appeared to be in a state nearer normality than before the onset of the analysis. The continuance of and the progress in the analysis itself at this time seemed to me to be indicative of improvement. In the analysis of psychoses progress within the analysis has to be relied on as there may not be any other standards or criteria on which to depend.

After the period described her condition in interviews began to vary much more frequently and quickly. The alternations between feminine and masculine identifications occurred very rapidly. They could be understood in terms of the swiftly changing relationship of the various people and objects in her phantasy.

The following is an example of part of an interview in which such very rapid changes occurred. At a time when, on the whole, suicidal tendencies were prominent, her voice once suddenly became soft and she tried to caress, fondle and tenderly embrace me. She said softly that she could never leave me. Then she suddenly yelled in a state of fear," Don't look at me—you are too nice." This was interpreted as a wish to preserve the image of a loved person by projection—at that moment I represented a loved person. She could only preserve her love by externalizing it. Immediately after this she pleaded with me in sorrow, in a rather vague but intense manner, to kill her. I interpreted this as the wish that the good object, which she had just wanted to preserve, would kill the hating person in order to protect the loved person from the hating person. She at once became more energetic and lost her vague look. She stated sorrowfully that she hated me, that I had no feeling and that I was dead. I interpreted this as a feeling that she could now tolerate feeling both hateful and loving and could tolerate imagining that I was both lovable and hateful. She then said sorrowfully that, if I did not love her, no one would. I related her sorrow to the new position with regard to me, and her hopelessness to the earliest situations of sorrow when she knew very few people, and if they appeared destroyed or unloving, the whole world seemed destroyed or unloving.

In later interviews, when the transference was to a nursing mother and when memory material was closest to the earliest weeks (when, according to her history, she was ill-fed and screamed) she tried to make me wear cushion as breasts, tried

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to expose my breasts, and had phantasies regarding how I could grow breasts. She yelled and choked in her bouts of anger, sucked many objects, and often smiled in her attempts to love, and described oral sensations, which were accepted as memories of feelings in her mouth before she had any teeth. After 18 months' treatment she drew very childish representations of a wild child. In the next interview she tried to draw a mess which she felt inside herself. What she drew was at first a sheet of scribble, but the form gradually changed during about 20 minutes. I interpreted her activity as the wish to remake her mother's breast which she believed she had eaten and to restore it to me in place of her mother. At that moment she became conscious of her drawing as a fair representation of a full-sized breast. Her relief was great, and her associations were immediately of good relationships between mother and child. She then drew a happy baby.

Writing and drawing proved very useful during this analysis. Writing was sent or brought to me from about the seventh month. After the sixteenth month less was brought. I always accepted the writing and tried to read it aloud in interviews and to interpret it if possible as I went along. In general, writing was interpreted as a projection acting as a defence against oral activities. Occasionally it was related directly to the derivatives of play with her stool. Once she wished to write her name on my body, and this could be related to play with her stool. More intense anxieties were analysed in connection with writing being used as a secret and silent defence against oral situations. Earlier in the analysis she brought writing in a secret code and soon afterwards began to bring drawings without writing. She brought mirror-writing and a small mirror which she kept in her hand, thus enabling her to control whether I could read what she had given me by letting me use the mirror.

The drawings were interpreted as the projection of memory and of phantasy material. Associations and descriptions of the drawings were requested by me, but if, as was usually the case, none were obtained, I interpreted them, as far as I could, on the basis of content in connection with the situation at the moment. When she began to draw and scribble during interviews, it was possible to interpret the type of activity and sequence of activity as well as the content.

After discharge from hospital she continued treatment for about 18 months. She was well when last heard from early in 1948.

The preceding outline of the type of patient, the sketch of the general progress during treatment and the few details of samples of the analysis is an attempt to condense several hundred hours' work into a short paper.

This type of psychotic patient ordinarily has a very serious prognosis. Homosexuality, masochistically perverted masturbation, and manic-depressive depression slowly worsening from adolescence to twenty are symptoms usually considered prognostically serious. Nevertheless if time is available, if adequate nursing help is available, if colleagues are co-operative, and if psychoanalytic methods are persistently used, great improvement in such a patient's condition can occur, and material of great value as far as psychopathological research is concerned may become apparent.

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THE APPLICATION OF PSYCHOANALYTICAL PRINCIPLES TO THE HOSPITAL IN-PATIENT.*

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THERE is no need for re-stating, in general terms, the importance of the psychoanalytical contribution to psychiatry. This has been discussed here on several occasions, and possibly more seriously than in any other society of psychiatrists. I am referring to the papers read to this section by Bernard Hart (1), David Forsyth (2) and Edward Glover (3). They form a most interesting introduction into the problem of the relationship between psychiatry and psychoanalysis. Psychoanalysis has not been the main topic of discussion in this section since Edward Glover's address on the application of psychoanalytical principles in psychiatry thirteen years ago. Since then the psychiatric scene has changed out of recognition. We have entered an era of great therapeutic activity. The hospital in-patient with whom we are concerned to-day has been subjected to a variety of physical methods, and the campaign has still not reached its peak of intensity. It is too early, at this stage, finally to assess the therapeutic value of those treatments, but we can say this much already: it is most unlikely that they will save us the trouble of studying mental illness the hard way. Psychiatry cannot afford to neglect any approach that promises to contribute to the understanding of mental phenomena. It is against this background of psychiatric developments that psychoanalysis has again been chosen for discussion here.

Considering that there are a great many activities, and a vast number of problems in hospital work to which psychoanalytical principles can profitably be applied, it would be difficult to attempt a comprehensive survey in the limited time available. I shall try to give you a personal account instead. I want to tell you how much help psychoanalysis has given me in my clinical and research work as a psychiatrist. I am going to talk mainly about clinical observations on mental hospital material, but I shall from time to time take the liberty of commenting on problems that appear pertinent to the subject under discussion. I should like to say at once that nothing is further from my mind than the ambition of setting a standard for the application of psychoanalytical principles in psychiatry. How widely and how deeply these principles will direct and pervade the activities of a psychoanalytically trained psychiatrist will depend not only on the amount of work he is called upon to do, much of which may not lend itself to the analytical approach, but also on his personal leanings and talents. I have no doubt that many of my psychoanalytical

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colleagues would have delved deeper into the unconscious than I did in dealing with some of the problems I tried to elucidate. However, they must not forget that most of the case material in the mental hospital is not accessible to analytical treatment in the strict sense. The psychoanalysis that can be practiced there is in the main applied psychoanalysis.

Dr. Rickman, in his opening remarks, has stated the principles that govern the doctor-patient relationship with admirable clarity. They apply irrespective of whether or not psychoanalytical treatment in the strict sense is attempted. It is true that the basic concepts of psychoanalysis have been evolved in the psychoanalytical treatment of neurotics. However, it is well to remember that most of Freud's contributions (4) to the psychological understanding of the psychoses were based on material that had not emerged in the psychoanalytical treatment of psychotic patients. Such highly important contributions as the papers on paranoia and melancholia, are really examples of applied psychoanalysis. This proves that the psychoanalytical treatment in the strict sense cannot be regarded as the only legitimate source of progress in clinical psychoanalysis. This brings me to another point, the importance of which cannot be emphasized too often, especially among psychiatrists. Even now there is a tendency amongst psychiatrists to judge the significance of psychoanalysis on the basis of its value as a therapy, and to overlook the fact that psychoanalysis has, as Ernest Jones (5) put it, provided psychiatry with an interpretative, dynamic and genetic point of view. I hope that I shall be able to illustrate the applications of those aspects to you. Nevertheless, I want to say a word about therapy.

I have treated with psychoanalysis cases of very severe obsessive illness and anxiety states in hospital. The majority benefited from the treatment, but I do not want to enter into a discussion of therapeutic successes and failures on this occasion. Dr. Rickman has pointed out the complications that are apt to arise when more than one doctor is involved in the medical care of a case in hospital. I can fully confirm his observations. These difficulties which originate from the transference situation, are apt to arise when the doctor who is carrying out the treatment is himself in charge of the ward to which the patient belongs, and is thus responsible for his conduct in hospital, his welfare and his discharge. The fact that the patient is bound to meet the doctor outside the treatment on the ward where he has to share him with others complicates the transference situation very considerably. The institution of the visiting psychotherapists which is being adopted by many hospitals meets those difficulties admirably. They do not arise to any marked degree where only superficial routine psychotherapy is given to in-patients. In that case the fact that the treatment is carried out by the doctor in charge of the ward may even have considerable advantages; but he has to watch the transference phenomena carefully.

My experiences with systematic psychoanalytical treatment of psychotic conditions in hospital are scanty and inconclusive. You know that Freud has expressed the view that those patients are not accessible to psychoanalytical treatment, as they are unable to form a stable transference relationship. This has not deterred a number of psychoanalysts from attempting psycho-

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analytical treatment of psychoses in hospital. It is clear that in the treatment of psychotic conditions, the analytical method has to be modified, and the technique advocated for those cases has much in common with child analysis. I am not a therapeutic enthusiast, but I see no reason why attempts at psychoanalytical treatment of selected psychotic cases should not be made by properly trained psychiatrists, especially under hospital conditions. Such studies are likely to yield interesting material, and are most unlikely to do harm. There are other reasons why such work could be very important. It would, for instance, be most interesting to study in this way selected cases before and after leucotomy. I would expect such investigations to cast some light on the effect of the operation on psychotic conditions. They could verify and elucidate certain clinical impressions, such as that leucotomy changes the schizophrenic from an introvert into an extravert. Such investigations could be very profitable even if they were confined to patients who had not made sufficient improvement to leave hospital.

I think I ought to say here a few words about the psychoanalyst's attitude towards current physical treatments. It is perhaps as well to distinguish between his attitude as a scientist and as a therapist. Psychoanalysis as a mental science is based on biological concepts. The prominence that it gives to the instincts implies that mental illness can be influenced by physical means without the detour over psychological mechanisms. It is therefore, quite natural that psychoanalytically trained psychiatrists have co-operated wholeheartedly in the administration of physical treatments, which are not incompatible with psychoanalytical principles. However, methodologically, and in the underlying approach, they are, of course, extreme opposites, and it is not unnatural that some psychoanalysts have expressed themselves strongly against their use. In a discussion on the application of psychoanalytical principles in mental hospital, it is perhaps not inappropriate to try to understand that attitude. The psychoanalyst views abnormal behaviour as manifestation of a struggle between conflicting forces, and he regards many of the most spectacular symptoms as indicators of a healing process. In his attempts to intervene therapeutically the psychoanalyst tries to modify and harmonize those forces, to change their direction and their objectives, and thus help the patient to adjust to reality. The psychoanalyst believes in the power of love and reason. In spite of everything that has been said to the contrary about him, he is an optimist and a humanitarian. How can it be otherwise, since he constantly discovers the child in all of us, especially in those suffering from mental illness?. The psychoanalyst is fundamentally a strategist. He feels about the more violent forms of physical treatment the same as a highly trained military strategist must feel about atomic warfare. One may disagree with him, but his convictions deserve respect especially if they are recognized as honest prejudices (6). They can do nothing but good if they remind us of an approach to mental suffering that will always rank as a great scientific and human achievement.

Psychoanalysts have not been unmindful of the fact that full analytical treatment is available to only very few, and some have tried to evolve shorter methods. The most recent systematic attempt on those lines is that of

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Alexander and French (7), but for the sake of clarity, those treatments which do not use the analytical technique had better not be called psychoanalysis.

Schilder (8) was guided by psychoanalytical principles in elaborating his method of group psychotherapy. In this country, Bion and Rickman (9), and especially Foulkes (10), have made valuable contributions to the theory and practice of group therapy based on analytical principles. That treatment is the subject of intensive research in many places, and I have no doubt that important developments will come from this new method which has already widened the scope of psychotherapy in hospital considerably. Like individual psychoanalysis, it encourages free play of emotional forces by the adoption of a group association method. I have practiced this technique with mixed groups of recoverable patients in mental hospital, and found it most interesting, and helpful. Kräupl (11) has recently reported on work with similar groups. Like everybody brought up with the concept of the individual interview, I had to overcome a certain resistance to that kind of treatment myself. I fully agree with those who have pointed out that in the group situation, certain behaviour features emerge which individual treatment alone might not have brought to light.

I do not want to discuss group therapy beyond saying that, as in individual treatment, the method has to be modified when one is dealing with psychotic subjects. The psychiatrist conducting the group has to be more active, and to intervene more often than in groups consisting of neurotics only. Conducting such a group demands considerable psychiatric and psychotherapeutic experience. I have found it particularly helpful in cases of schizophrenia entering a remission. Often the group situation acted as a stimulant for the individual interview. On several occasions the patient's reactions in the group situation helped me in arriving at a correct assessment of their improvement, usually proving that the patient was really better that I had assumed from the individual interview. My fear that psychotic patients would talk about their delusions in the group spontaneously did not materialize. It was surprising how discreet they were in this respect, and how open in other respects.

Group therapy on analytical lines is of great help in assessing how much of the social personality is preserved, especially if combined with a certain amount of individual treatment. It is hard work, but worth while. Like every psychotherapeutic technique, it is not congenial to every psychiatrist.

One of the advantages of group therapy is the possibility of having another colleague present at the sessions, if possible, as an active participant. This means that it can be learnt by direct observation, and considering the difficulty of teaching psychotherapy this is an important point.

So far, I have been concerned with some of the applications of psychoanalytical principles in the treatment of the hospital in-patient. There are other applications about which I do not intend to speak, such as the various methods of achieving abreaction with the help of drugs.

Having given some examples of the application of psychoanalytical principles in the treatment of the mental hospital patient, I would now like to refer to the importance of those principles for the understanding of abnormal behaviour and symptoms. But we cannot expect psychoanalysis to

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explain any of them fully and from every angle. There is no method of approach, however indispensable, that can by itself solve all the complex problems of mental phenomena.

Let us take but one instance—*folie à deux* will serve ; let us restrict that concept to the adoption of psychotic thought contents by a person who is not himself suffering from mental illness. The occurrence of this condition is usually regarded as due to increased suggestibility on the part of somebody who lives in close community with the psychotic subject. Lack of judgment owing to low intelligence, and constitutional predisposition have also been blamed. These explanations are far from satisfactory. *Folie à deux* belongs no doubt to the suggestive phenomena, but this statement only begs the question. It does not help us to understand why it happens in an individual case, nor are the victims particularly suggestible in their relations to others. The cases I studied were far from unintelligent. Common predisposition, even if it could be proved in all cases, could not explain the identity of the delusions in paranoid cases. In fact, paranoid patients are far from suggestible, and we know that psychotics living together in hospital over many years hardly ever adopt each others' delusions. To understand the *folie à deux*, we have to investigate carefully into the relationship between the persons concerned, their personality make-up, their conscious and, if possible, their unconscious tendencies, and the nature of the thought contents transmitted. I made such investigations with Hartmann (12) in a series of cases, all of *folie à deux*, and all with paranoid states. The mechanism underlying the process is that of identification as understood by Freud. Under normal conditions, gross identification does not take place in adult life, but it is all-important in childhood. We found that in those cases a strong tendency to identification had developed out of feelings of guilt which caused the passive partners of the group gradually to sacrifice reality. That strong sense of guilt had, in those cases, grown out of the feeling of having failed sexually and socially, and also out of repressed aggression towards them. The contents of the delusions, too, proved significant. They were ideas which could be traced as unconscious fears in the passive partner's mind. The adoption of the delusions meant sacrifice and punishment. We also turned our interest to the active partner of the group, the one from whom the delusions originated. We found in every case a character type with marked sadistic features, demanding the sacrifice of complete identification, and deriving strength from the fulfilment of those demands. When finally the spell was broken, and those who were the victims of their suggestive power freed themselves from the delusions and regained their independence, the condition of the paranoid patients deteriorated, and it appeared that with the loss of unity with the others, their resistance to complete withdrawal from reality failed rapidly. This suggested that their eagerness to make others share their delusions had been the expression of a defence reaction against the threat of isolation. This is only a poor sketch of what we found in those cases. Instead of accepting the apparently obvious, namely, that the man who takes over his wife's delusions is just more than usually gullible, we uncovered a constellation of conflicting forces which had been at work over years, and finally resulted in

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the sacrifice of reality. This may not be the whole story, but it is at least part of it. The method of investigation in those cases was careful exploration by psychiatric interview.

The discovery of a certain mechanism underlying abnormal behaviour in a number of cases does not mean that that mechanism is the only one that can cause it, and we have to be careful with generalizations. However, once one has established a certain dynamic constellation in a pathological case, however rare, it is often not difficult to recognize it in its milder forms, e.g. it can be said that our observations in the cases of *folie à deux* might be of help in the understanding of some other suggestive phenomena.

There are many other forms of abnormal behaviour which the application of psychoanalytical principles has helped to elucidate. I found the psychoanalytical approach most valuable in studying fugue states with the impulse to wander (13), and a variety of other psychopathological phenomena. Psychoanalytical knowledge, especially in its dynamic aspects, has helped me in the study of the interplay between obsessive-compulsive symptoms on the one hand, and depressive and schizophrenic reactions on the other hand. It enabled me to understand how interaction between abnormal mechanisms of different dynamic qualities, the one tending to disintegration, the other to preservation of the personality, is apt to modify the clinical picture, and the course of the psychotic process in individual cases. After I had established those observations on a considerable case material (14) with the help of psychiatric methods, I discovered to my satisfaction that Edward Glover (15) had come to similar conclusions in his psychoanalytical work. I think that such studies are of great importance to the psychiatrist. Prof. Kallman (16), the eminent American geneticist, has recently pleaded for concerted investigations into all the factors which are apt to modify or to nullify the effects of hereditary predisposition. The psychoanalytic approach, with its emphasis on dynamic as well as environmental factors, can be of great value in the study into such problems.

I have given you some examples of the applications of psychoanalytical principles to the clinical material that we meet in the mental hospital, and I hope that I have been able to demonstrate the value of the psychoanalytical approach. Psychoanalysis has contributed a great deal to the knowledge of psychotic mechanisms and to the understanding of psychopathological products such as hallucinations and delusions by deciphering their unconscious meanings. It is a pity that workers in the mental hospital who have the ideal material for such studies at their disposal have taken so little serious interest in those problems.

In a discussion such as this, it is not out of place to devote a few remarks to the significance of psychogenetic propositions in psychoanalysis. They attempt, as Hartmann and Kris (17) have pointed out, to establish a causal relationship between the individual's retreat pattern in conflict situations and early impressions in which the pattern was gradually formed. In other words, "they try to answer the question when that particular form of reaction was learned or adopted first, and why a certain conflict was solved in a certain manner." You see, psychoanalysis may be able to describe how a condition

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under observation has grown out of a person's past, but may not necessarily be able to say why it has done so. This applies particularly to the psychoses. The conception of psychogenesis, therefore, does not imply that a condition which we can trace back to its roots in early childhood is necessarily caused chiefly by environmental experiences at that period. But that is exactly the idea that most people have of psychogenesis. To psychoanalyse a patient means to them to set out to find certain environmental experiences or constellations which are solely responsible for the illness. This is a misconception of psychogenesis.

Psychological understanding of a mental illness from the psychoanalytical aspect does not even exclude the possiblity that it is an organic disease. On the other hand, the organic nature of an illness does not imply that it cannot be influenced psychologically. I am referring to some psychosomatic conditions. Viewed from this angle, the difference between physiogenic and psychogenic is not fundamental, but we must not over-rate the impressionability of the organism by psychological means. Whether it will fall to the psychoanalysts to give the final answers to the question of the cause of mental illness we are unable to say, but psychoanalysis will certainly be indispensable in helping to formulate the problems and to shape the answers.

From what I have said about the biological foundations of psychoanalysis it is clear that it is not incompatible with any other scientific approach to mental illness. Masserman (18) and his school have shown by their experimental work that the psychoanalytical and reflexological approach can be co-ordinated with great profit. It is felt by many that the neurological approach to mental illness from which they expect the final clarification of its mysteries is incompatible with psychoanalysis. The view has been expressed that the occurrence of complex psychopathological symptoms in cases of organic brain lesion has proved the futility of psychoanalysis. I would like to demonstrate to you that, on the contrary, psychoanalytical knowledge can be of help in the elucidation of certain symptoms of organic brain lesions. In entering the precincts of neurology I am not aware of any trepidation, nor do I feel that, to gain admission I have first to try to raise one or the other mental phenomenon to the dignity of a reflex. Having been brought up as a "Neuropsychiatrist" and having had the great good fortune of training under Paul Schilder, I see no difficulty in combining the neurological and the psychoanalytical approach.

When post-encephalitic sequelae were first studied, the occurrence of obsessive-compulsive symptoms, especially during the oculo-gyric crisis, aroused considerable interest. I studied a series of such cases, and was able to make some interesting observations (19). In those patients, the organic illness had caused an impairment of the equilibrium between the libidinal and destructive tendencies, resulting in a constellation not unlike that found in obsessional illness. I pointed to the interesting fact that obsessive-compulsive phenomena had been described only in such cases of brain lesions in which those parts of the brain related to the control of instincts were affected. It does not, of course, follow from these observations that obsessive-compulsive symptoms are always due to organic lesions, but it does mean that the

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anomalies in the instinctual sphere to which they are related may sometimes be due to such causes.

Knowledge of psychological mechanisms discovered by psychoanalysis has helped me in the study of the body image, of the symptom of unawareness of physical disability and of such primitive phenomena as echo-reactions. Schilder and Pötzl have pointed out that certain features in aphasia could be understood in the light of mechanisms described in psychoanalysis, and this is not surprising. If we assume that psychoanalysis has something to say about the structure and functions of the mind, there is no reason why it should not be able to throw light on those functions when they are impaired by organic lesions.

I hope I have not digressed from the subject of our discussion. It is true, I have left the in-patient behind for some time, but I have been talking about his problems and have tried to contribute to the understanding of principles the wider application of which would make the mental hospital an even more interesting place than it is already.

Psychoanalysts do not claim a monopoly for their approach in psychiatry. They do claim, however, that for a great number of psychiatric problems, theoretical and practical, their approach is indispensable. I am looking forward to the time when more psychoanalytically trained psychiatrists will work in mental hospitals, and take part in the great work their colleagues are doing there. How and to what extent the psychiatrist who is not psychoanalytically trained can and should apply psychoanalytical principles is a very important question, but it lies outside the scope of to-day's discussion. I would only like to say that he should refrain from doing so, without having given careful preliminary thought and study to those principles.

Some of you may feel it a bit unfair that I have dwelt at some length on the misconceptions existing among psychiatrists about psychoanalysis, but have not even mentioned the misconceptions that exist among psychoanalysts about general psychiatry. They are very considerable, and would need much more time to discuss than I have at my disposal. I can assure you that those among the psychoanalysts who have general psychiatric experience are doing their best to help their colleagues towards an understanding of the psychiatrist's problems.

Psychiatry and psychoanalysis have too long been divorced from each other. The benefits that would come from closer co-operation, based on mutual understanding and respect, would be very great indeed.

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HOMICIDAL INCIDENCE IN THE DEPRESSIVE PSYCHOSES.

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Introduction.

Although homicidal tendencies are well recognized in the depressive psychoses, this medico-legal aspect of the illness receives only cursory mention in text-books, e.g. Henderson and Gillespie and Noyes, if it is referred to at all. Inasmuch as it is on this most serious complication that the psychiatrist is most liable to be asked to give evidence in court, there would seem to be good reason for examining the factors leading to such behaviour, and comparing them with similar data from non-depressive homicides. It is hoped that these notes will show a behaviour complex peculiar to the melancholic subjects.

Where possible, in the series of Tables which follow, the facts for the depressives will be given side by side with the non-depressive group, for easier contrast or comparison.

The psychopathology will not be discussed because it has not been possible, for obvious reasons, to display it in the control group, and also because, no matter how interesting it may be to the psychiatrist, it is doubtful if it would ever carry as much weight as would objective and observable facts, with those having a non-medical interest in these cases.

Material.

Homicidal depressive states are not very common, and consequently it is difficult to obtain a large enough series to make the inferences drawn from it indisputable. Careful examination of many hundreds of depressive states admitted to an acute mental hospital has brought to light only 20 in which a definite act was perpetrated; but since interest in this subject was stimulated, the lesser evil of homicidal thoughts in depressive cases has been found much more commonly than was previously supposed, though this can only be brought to light by direct questioning because the patients will refrain from spontaneously mentioning this, even when they are quite willing to admit to suicidal tendencies. The homicidal cases then consist only of those in which a definite act was committed. The control group consists of an unselected number (29) of persons convicted of homicidal acts, none of whom was judged to be insane medically or in the legal sense at her trial. They may be described as normal criminals, and were not dealt with psychiatrically in any way, either at the time of their trials or in the immediate periods following. Since

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experience has shown that women depressives are more prone to homicidal acts than men, the whole of the control group consists of women.

It will now be convenient to examine the material in more detail.

The sex incidence has already been referred to and needs no further elaboration, except to say that of the 20 cases here considered only one was a man. This bias to the female side is probably exaggerated, but a careful perusal of case-sheets always resulted in many more females coming to light than males.

TABLE I.

	Average age.	Age limits.
Depressives	29 years 6 months	21–48
Non-depressives	27 years 7 months	16–54

This table deals with the age of the cases at the time that the crime was committed. It will be seen that the average age of the psychotic and control group is approximately the same, i.e. the latter twenties, but that the extremes show a much wider variation in the control group, which is conspicuous by the lower limit of 16. To make this somewhat clearer, a second table was compiled, showing the incidence in 5-year age-groups.

TABLE Ia.—*Age-Groups.*

	Under 20	21–24	25–29	30–34	35–39	40–44	45–49	50–54
Depressives	0	25%	25%	35%	10%	0	5%	0
Non-depressives	24%	21%	17%	14%	10%	10%	0	3%

Several interesting differences between the two groups now come to light. Firstly, it will be seen the age-group with the highest percentage in the psychotics is 30–34, whereas in the non-psychotic group 16–20 is the corresponding period. Moreover, before the age of 25 only 25 per cent. of psychotics have occurred, whereas in the non-psychotics the figure is 45 per cent. After the age of 40 there is a decline in both types. The significance of these figures can be interpreted in two ways, of which the second is, in fact, a corollary of the first, viz., (*a*) the reason for homicide arises at a later age in the depressives, and (*b*) this is due to the fact that depressive psychoses do not as a rule show themselves until after the age of 20. It will also be seen from these age-groups that ages up to 34 account for no less than 85 per cent. of the depressive homicides. The reason for this is that this symptom is much more frequent in first attacks of depression than in subsequent ones. The significance of this will be referred to again later.

TABLE II.

	Married.	Single.
Depressives	90	10
Non-depressives	55	45

The next consideration with which this paper is concerned is the civil state of the two types under consideration. Of the depressives 90 per cent. were married, whereas only 55 per cent. of the controls enjoyed this status.

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Amongst the unmarried group we find only 10 per cent. psychotics and 45 per cent. of non-psychotics.

TABLE IIA.—*Civil State.*

	Married.	Single.	Widowed.	Separated.
Depressives	90%	10%	0	0
Non-depressives	14%	45%	0	41%

A subclassification of this, as in Table IIA, in both groups is of great importance, for the 55 per cent. of married cases in the control groups whittles itself down to 14 per cent., since the remaining 41 per cent. were separated from their husbands. Separated, it should be added, is here used in the physical sense, whether or not this state of affairs had been legalized. The 90 per cent. of the depressives could not be so divided—there were no separations.

Social psychiatric histories taken on the depressive cases confirm these figures, and it is monotonous to find that these unfortunate women were, up to the time of their illness, leading very ordinary contented married lives. With this important difference in mind between the depressive and other homicides, it will here be convenient to consider the victims of their assaults. This factor has been classified in Table III.

TABLE III.—*Victims.*

		Child.	Children.	Family.	Friends.	Others.
Depressives	Married		100%	10%	..	..
	Single	50		..	50	..
Non-depressives	Married	67 (100% illegitimate)		33	..	..
	Single	78 (89% illegitimate)		15	8	..
	Separated	84	8	..	..	8
		100%	100%			
		illegitimate				

In examining these figures some very important points are brought to light. For the sake of emphasizing these differences the above classification was adopted. It will be seen at once that the whole of the married depressives have attacked members of their own family, and that it is always the children who suffer, with, on occasions, other members of the family as well. At first sight it is difficult to see the similarities between the married and the single group, especially when one finds a single woman attacking friends, but in this case the patient had left her own family and lived with her victims, who had in fact taken the place of her own kith and kin, and were the recipients of all the affection this unfortunate woman was able to give. In the case of the single woman who kills her child, the circumstances are not dissimilar when one knows that the woman was genuinely fond of the infant.

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But the depressive does not necessarily attack the whole of her family, and it would seem worth while trying to discover just why the family are attacked. It will at once be obvious that within the circle of any happily married woman the family is naturally those of whom she is most fond, and we have seen that she directs her homicidal trends to these. It is not surprising that just as her family is the centre of her affections within her circle, so within the family she may lavish more affection on one member than another, and from what has already been said this over-loved member will be the victim. The following two cases will serve to illustrate this:

D. N. T— was a married woman, aged 33. She left an unpleasant family circle to marry a widower with 2 children, and was described by those acquainted with her as an excellent "mother" to these children. In the course of time she became pregnant and the confinement satisfactorily concluded. Within a short space of time after leaving the hospital, before she had fully recovered her physical health from the confinement, the following incident took place. The husband had had his breakfast one morning and sent the children by his first marriage to school. As his wife was still in bed he went to see her before going to work, and on entering the bedroom found his wife hugging the baby and fussing it as any new mother will. The father departed for work with no idea of the impending tragedy. When left alone this woman attempted to kill herself and the child by coal gas poisoning, and when this failed strangled the baby with a pyjama cord. It would be difficult to imagine a better example of a woman killing the one person of whom she was most fond.

M. L— was a married woman of 32 with a son aged 6 and a daughter 2 years old. She was well known to be fonder of the daughter than the son. One day she was interrupted by her husband in the act of suffocating the daughter after she had taken some disinfectant herself.

In contrast to this it will be noticed that, in the control group, although the number of crimes directed against the children are high these children are largely illegitimate, and the mother, instead of killing the one of whom she is most fond, tries to rid herself of what to her is a hindrance and inconvenience. The following two cases to contrast with the depressives may be used for illustration:

CASE XXV.—Married woman, aged 35. She was delivered of an illegitimate child in a friend's house. Her husband was unaware of this and she was afraid to tell him, so on her way home she put the infant in a sack and threw it in a lake in a park through which she was walking.

CASE XXXII.—A single woman of 32 gave birth to an illegitimate child. She made efforts to get it adopted, and when these were unsuccessful undressed the infant and dropped it in a river. In this last case the woman made two attempts to get rid of her encumbrance, and her determination in this direction may be judged when it is realized that at the time of drowning it was only 7 weeks old.

Passing from the difference in the two types of victims, we may pass to a consideration of the commonest accompanying symptom found in the depressive cases. This is the well-known tendency to suicide. Table IV again contrasts the two groups.

TABLE IV.—*Suicidal Incidence.*

	Definite.	Indefinite.	Non-suicidal.
Depressives	95%	5%	..
Non-depressives	3%	..	97%

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In the depressive group it will be noticed that the large majority are also suicidal, whereas in the control group the opposite holds good. Our concern will obviously be more with the exceptions than the rule. Now, it must be conceded that the assessment of the suicidal risk in a depressive state is not an easy task, nor is it judged by uniform standards, and consequently psychiatrists will at times disagree as to severity of this chance in any given case. The picture is complicated by the fact that this risk of itself varies from time to time in the same case. The question of these patients being, or not being, suicidal must thus be taken for granted as the considered opinion formed when the cases were seen, and based on questions put to the patient as to her state of mind when the homicidal act was attempted, or of the presence of a definite suicidal act, for all intents and purposes, simultaneous with, or occurring shortly after, the homicidal episode. On these lines it may be safely assumed that the tendency to suicide was a very definite risk when it is so marked in the table.

Now for the exceptions. Firstly, the doubtful depressive case. Although in this instance the woman made no direct admission of her wish to do away with herself, the chances are that this intent was present, as she displayed many other depressive symptoms which commonly accompany such behaviour, i.e. self-reproach and condemnation because she was unable to breast-feed her child. The non-depressive control case which is marked as being suicidal is of special interest as it displays some of the factors common to the psychotic group, but for other reasons, to be referred to later, can be ruled out of that class. It may be summarized thus :

CASE XIX.—Woman aged 44, married but separated for 4 years. Had 1 illegitimate child and 2 legitimate. She was worried by her financial affairs and a fear that her husband might take his two children from her. She attempted to gas her 3 children and herself, but all recovered except the illegitimate baby. This, however, is the exception rather than the rule.

METHOD AND SITE.

These two factors are difficult to display in tabular form, and to make an accurate comparison between the two groups each case should be examined in detail, which would make these notes unduly lengthy. It has therefore been thought advisable to refer simply to the common factors found. The two factors are taken together because they are intimately related in the psychotics.

From our consideration of the victims we have seen that it is the one of whom the patient is most fond that suffers, and as this is so often a child it is not surprising also to find that the crime tends to occur most frequently in the home, although not necessarily so. With the other type being considered here it may also take place in the home, but quite frequently away from the criminal's residence, which is again to be expected when the difference in motivation is realized. In this series all the psychotics committed their assaults at home, but I have known of instances when other sites have been chosen : these are the exceptions rather than the rule. The non-psychotics, however, tend to be more careful in their choice of site, as in Case XXXII already noted.

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The method goes with the site, and the psychotic invariably chooses a means close at hand: she drowns her child in the bath, or suffocates or poisons it by gas, but not by purchasing some noxious drug from the chemist a week or so beforehand. If her homely method fails, the depressive continues the act with the next available instrument. In the case of D. N. T— it was seen that when gassing failed in the bedroom she resorted to the pyjama cords and strangulation. It will not be surprising that sometimes this gives rise to a crude brutality out of keeping with the type of victim. This is important, because it shows that there is no indication of the presence of a psychosis to be found from the study of the method alone, other than the fact that depressive homicides show but little previous planning. The case of V. W— shows this. She is a very happily married woman in the thirties, and her crime consisted of a homicidal assault on her two children. She attempted to drown them both in the bath, and when the elder struggled to get out she hit it on the head with a hammer which had, unfortunately, been left lying in the bathroom.

It is, however, in the sequel to the crime that the most striking difference in behaviour becomes apparent in the two groups, and this may be conveniently taken next.

After-Behaviour.

Some slight explanation is needed of this term. It refers to what occurred immediately after the crime, other than a suicidal attempt. An effort has been made to summarize this in the next table.

Table V.—*After-behaviour.*

	Help.	Normal.	Ran away.	Other.	Doubtful.
Depressives	95	..	..	5	..
Non-depressives	7	66	3	10	14

The headings under which the behaviour is classified have the following meanings: "Help" signifies that the patient went for assistance. The type of assistance varied with the circumstances under which the crime was committed. "Normal" indicates that the persons carried on with their daily routine as if nothing unusual had occurred. "Ran away" is self-explanatory. "Other" concerns 3 cases in which some totally unpredictable features followed. In the first of these the woman washed and nursed her drowned illegitimate child; in the second a young woman, after killing her illegitimate baby by drowning and skull injuries, went off to see her boy friend; and in the last a girl of 19 suffocated her illegitimate child, and then went to stay with a girl friend. The heading "doubtful" is used because the classification here was impossible. In these 4 incidents the after-behaviour was unknown in one; in another a woman was so ill after her confinement that she was rushed to hospital for a blood transfusion; in the third a woman murdered her mother of 80 by hitting her on the head with an axe, and then went for a ride on her bicycle; and the last went to her mother-in-law's, after killing her illegitimate child, for no particular reason.

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The important point of this table is that the psychotics all went for aid, except one who was found immediately after the act. Often this aid was the police, relatives or friends near at hand, a doctor, or, as on one occasion, the woman ran to her husband at work. Now this behaviour following the act necessitates the leaving of the victim, and in consequence there is no attempt to conceal the crime. On the contrary, this behaviour is just that which brings it to light. When this is compared with the control group we see that the very opposite holds good. Most non-psychotic crimes are committed in seclusion, and there must be a short interval before the perpetrator can resume a normal routine, as so many of them appear to do. The important difference is that they do not call for assistance and so reveal their acts, and when this short interval prior to resuming their ordinary lives is filled in, concealment in some form or other is frequently found. The effort of hiding the act is well revealed in a girl of 18 who gave birth to her second illegitimate child whilst staying at a friend's house. Her previous child was born when she was 14. The labour occurred during the night, and she carried on in a normal way during the next day, but had managed to get rid of her offspring in a well at the back door of the house in which she was a guest. Even the woman who was rushed to hospital for a blood transfusion (mentioned above) after her confinement managed to push the child down the lavatory; or more obviously still the case of a 20-year-old girl who got rid of her 3 weeks old illegitimate child by burying it in a field. Two other cases will be enough to accentuate this: a married woman of 29 strangled her 6-year-old illegitimate child with a belt, and kept the body for 4½ months in a kitbag in a cupboard in her room; and the 27-year-old married woman who cut the throat of her newly-born child, and attempted to burn it under the kitchen copper. The father of this child was the woman's step-father, and she had concealed her pregnancy from everyone, and made no preparation for the child. In Case XIX, which was suicidal, the typical behaviour of going for aid was absent, and the next point under consideration totally inapplicable. This then could not have been a depressive crime.

Previous Symptoms.

This most important point in deciding if a homicidal assault is due to a depressive psychosis or not has been left until last for this reason. It is obviously completely absent in the control group, and it is the type of onset of the psychosis with which we are particularly concerned here. Now most of these cases come to light because of the crime associated with them or, to put it another way, the police discover the patient rather than the relatives. Two possibilities present themselves for consideration, viz. (*a*) that the onset of the illness is the homicidal attack itself; (*b*) that the previous symptoms are so slight that the seriousness of them is overlooked. It may be said at once that the first possibility does not exist. In short, no depressive homicide was without symptoms of her illness before the crime, and so (*b*) has to be considered. This will obviously depend on the persons who observe the symptoms, for the labourer can hardly be expected to judge these with the same skill as the psychiatrist. An example, at some length, of this regret-

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table lack of appreciation of symptoms by those who might be expected to pay more attention to them will perhaps not be out of place in showing how easily even gross cases are overlooked. K. A. W—, aged 27 is the wife of a clerk in the Air Ministry. She killed her 4-months-old child by drowning. She was living with her mother at the time of the tragedy. In August, 1940, she gave birth to a female child. She had always wanted a girl "more than anything else in the world," and was very pleased when her wish came true. On her return from hospital the child developed an abscess in the breast, which required a minor operation. During this the patient waited outside, weeping copiously. She developed insomnia—in part due to the air raids—and when an "incident" occurred near her home she complained to her sister-in-law that she could no longer look after the baby. For the next few days she was crying, ate little and seemed dazed. She went to a general hospital and was an in-patient for 2 weeks. Her condition did not greatly change, and she was sent away with the child to a country house for invalid evacuees. After one night here the authorities refused to keep her, as she was "hysterical." She returned to London, but to her mother's house, where she had fits of crying, complained of tight bands around her head, and was morose and silent. She complained that the house and herself were dirty, when in fact the opposite was true. By now the baby had completely recovered from her minor illness, and the patient's symptoms improved with it, but soon she again could not sleep, took no interest in anything, thought people were looking at her, and that there was something wrong with her child. She took the child to a welfare centre on several occasions with ridiculous, almost irrational complaints about its health, e.g. its legs and back were crooked. One morning her parents returned from shopping to find the child newly drowned, and the patient contemplating suicide. Her remark at the time was to the effect that what she had done was for the best, as she could not leave the child to the care of others.

In this history the relatives may be excused their lack of insight, but one might have thought that the welfare centre would have realized something was wrong with her when she made her ridiculous complaints of the child's health, and one is even more amazed that the catastrophe was not averted when she herself had been under hospital care.

It will be obvious from the above that symptoms are often very gross before the act, but sometimes much less conspicuous than in the example given, but this will still be one of the main features in deciding that the patient's behaviour is due to the illness. In the non-psychotic cases there are, of course, none of these preceding signposts pointing to the cause.

It may be convenient at this point to summarize the factors in favour of a depressive crime, and discuss each in turn when additional points need further elucidation, with some extra comments.

Discussion.

The easiest way to deal with this aspect of the subject is to take a hypothetical case showing every possible point in favour of a depressive psychosis,

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and then deal with each in turn. Such a case will show the following points:

It will concern a married woman, rather than a man, of about thirty years of age, who kills the person or persons of whom she is most fond, adopting a "homely" method; who is also suicidal herself, and yet goes for assistance after the crime: and finally who has shown the symptomatology of a depressive psychosis before the incident with which we are primarily concerned.

The civil state and age of the person requires no comment, beyond that already made when these points were tabulated.

The sex of the person has already been referred to, and it has been suggested that such crimes are commoner in women than men.

Nothing further need be said about the victim.

The combined question of the suicidal tendency and after-behaviour may be taken together, particularly as at first sight it seems contradictory for a suicidal person to go for aid after a homicidal attack. Certain facts about the tendency to suicide in the depressive psychoses are well known to psychiatrists. Firstly, it is common—much more common than homicide; but we have seen that the latter only occurs when the former is also present, and it is consequently not unreasonable to look upon homicide as an extension of the suicidal impulse. It has been suggested that suicide may be considered as a form of aggression against the self. If this view is accepted, then homicide is an extension of aggression to include not only the self but those things which are nearest to the self, and this will explain the characteristics of the victim, who is almost, in fact, a part of the patient's self. The next difficulty is to discover why the complete act of homicide plus suicide is not always indulged in, but sometimes stops short at homicide. Most psychiatrists will have seen unsuccessful suicidal attempts in depressive states, and will often have been impressed by the fact that immediately after such an event the patient has no wish to repeat it. It is not suggested that this is always true, but sometimes the whole depressive illness shows signs of a rapid remission after such an episode. If we consider the homicidal-suicidal complex as a complete whole, then its semi-completion—i.e. homicide only—corresponds with an unsuccessful suicidal attempt in non-homicidal depressions, and after the homicide has been done the urge to complete the act is lost, and so the suicide is not attempted.

The after behaviour of the homicidal depression now resolves itself into three possibilities. I: Suicide—which may or may not occur. II: The interruption of the act, as in the case described under "previous symptoms," where suicide is unlikely to occur. III: The rush for assistance. No enlargement of I and II is necessary. III forms the characteristic behaviour of these cases, and its importance is to be found not only in the positive steps taken by the patient, but also in the negative omissions that must go with it, e.g. the lack of attempts to hide the crime. It will be obvious that I and III may occur in combination.

With regard to the *modus operandi* of the crime, it will be noticed that collusion between two people is not possible in this type of homicide, unless both are depressed. Such examples may be seen in the so-called "suicide pacts."

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The after-care of these cases is of great importance, since depressive states tend to recur, although recovery from any one attack is the rule. The psychiatrist is faced with two problems. Firstly, is the homicidal impulse liable to come back? and secondly, should a woman who has killed a child be advised against further pregnancies? The first problem is in some ways the more difficult, and partly helps in answering the second. Just as suicidal tendencies may recur in subsequent bouts of depression, so may homicidal, but with this difference. Once patients have been successfully treated for a depressive illness they gain insight into their condition, and consequently in future attacks there is a tendency for them to seek treatment earlier, and thus the homicidal risk diminishes. Further, not only does the patient gain insight, but also the relatives, and the overlooking of symptoms, as in the case illustrated, is much lessened. This decrease in the homicidal tendency in further attacks of depression helps to solve the second difficulty. If the victim is an only child or the youngest of a small family the patient will be very conscious of this child's absence, and the loss of any article can only satisfactorily be solved by the introduction of a similar one in its place. Therefore, further pregnancies should be permitted, the earlier the better, as by this means the unfortunate woman's mind becomes detracted from her past and directed to her future. Occasions have already been noted in which the crime has been associated with a depressive state occurring at or shortly after the confinement. This, in itself, is no bar to future pregnancies, as it is not certain that a second depressive state will accompany a second pregnancy, and even if it should, the tendency to earlier observation in second attacks decreases the homicidal risk.

Some difficulties in diagnosis present themselves to the psychiatrist when dealing with these cases. Reference has already been made to the sudden improvement that may occur in the mental states immediately following the catastrophe. He will then be faced with an apparently normal subject, and his task is made the more difficult if the only means of eliciting the previous symptoms is the patient's own description. When, however, the behaviour complex follows the outline charted here, he has a strong case in favour of a depressive illness; and if the patient's previous symptoms are in keeping with this diagnosis it is certain, since the possibility of any one person inventing the previous symptoms corresponding with her behaviour at the time of the crime is negligible.

The second difficulty in diagnosis arises when the patient is first seen some time after the act, and the symptomatology is not of the most severe. If the patient knows that the psychiatrist is seeing her to find an excuse for her behaviour, she is often examined in a state of remorse of the past and hope for the future, which results in a confused obfuscation of thinking superficially, quite unlike a depressive state, and which, at interview, may prevent the patient giving a clear picture of the early symptomatology. In such conditions reliance must again be placed upon the typical behaviour pattern.

Finally, the psychiatrist is confused by the differentiation between infanticide and murder. There is no medical reason why 12 months should have been chosen as the dividing line, and yet a woman who kills her child under

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that age has a greater chance of leniency from the courts than if the child is older, and a much greater chance of leniency than a man who shoots his wife, even when the cause in all these cases is a depressive psychosis.

Summary.

1. The behaviour of homicidal depressives has been examined.
2. A typical behaviour pattern has been suggested.
3. The various factors associated with this pattern have been discussed.
4. A comparison of each factor with non-depressive homicides has been made.

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ELECTRONARCOSIS, WITH SPECIAL REFERENCE TO THE TREATMENT OF PARANOID SCHIZOPHRENIA.

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ELECTRONARCOSIS is a state of coma, or anaesthesia, induced and maintained by the continuous passage of electricity through the brain. Although described in animals and man many years previously, it was not introduced into psychiatry until 1944, when a group of Californian workers (Frostig *et al.*) experimented with its use as an alternative to insulin coma treatment in schizophrenia.

Technique and manifestations of electronarcosis.—A machine to produce electronarcosis should deliver a current which remains steady in spite of changes in the patient's electrical resistance. In the writer's original series the domestic alternating current was used and the electrodes placed bitemporally. Details of this machine have been published previously (Medlicott, 1947). The narcosis is started with a current of 160 to 250 milliamperes, which is reduced to 60 milliamperes after 30 seconds. During the passage of the high current a tonic spasm at first flexor and later extensor is maintained, and is followed by a few clonic movements on dropping the current. The clonic movements are followed by muscular relaxation, and respiration is re-established at 60 to 70 seconds from the commencement of treatment. With the re-establishment of respiration the current is gradually increased at the rate of five milliamperes every 15 seconds. As the current is increased to the limit of the patient's tolerance respiratory stridor is produced. The commonest difficulty met with in electronarcosis is that of maintaining adequate narcosis at a current level which does not produce severe stridor. The original workers caution against increasing over a limit of 125 milliamperes and making any increases after five minutes of treatment because of the danger of inducing convulsions. However, in a number of the writer's cases convulsions were purposely precipitated late in treatment and were very well tolerated. Although treatments as long as 25 minutes were sometimes given, the usual procedure was to switch off the current after seven and a half minutes of treatment. The patient was started on three treatments a week, and the interval between treatments gradually increased as improvement occurred. Over 30 treatments are quite often necessary. The final results of treatment should not be assessed for at least a month after its termination, as initial improvement often continues to full recovery in this post-treatment period. This time lag between termination of treatment and the achievement of full recovery reminds one of the course of events in some cases after leucotomy.

Noteworthy accompaniments of electronarcosis are the raised blood pressure during and for a few minutes after treatment, and the relative hyperglycaemia

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and lymphocytosis during and for a variable time after treatment. These have been reported in detail elsewhere (Medlicott, 1947), and appear to result from prolonged stimulation of the sympathetic nervous system.

Tietz *et al.* (1946) found no physical complications in their series of patients, but in 30 per cent. of the writer's patients the resting blood-pressure rose to above normal limits during the course of treatment, and in some cases persisted at hypertensive levels for several months after treatment was discontinued.

Emotional dulling and some memory defect were common towards the end of a long series of treatments and a few patients became confused. Such conditions cleared up after treatment had been discontinued. Considering the total number of milliampere-seconds of current (tens of thousands) that pass through the brain during the average treatment the amount of memory change is surprisingly little, and in some cases it could not be detected with the usual tests. It is the writer's impression that the intensity of the current rather than the duration of the current flow is the more important factor in the production of organic brain damage. In electroconvulsive treatment where currents of higher intensity flow for only a fraction of a second memory loss is almost as common as in electronarcosis. In a series of electroconvulsive cases treated recently, using unidirectional brief stimuli currents of square wave form, it was possible to produce convulsions with $\frac{1}{30}$ to $\frac{1}{10}$ of the quantity of electrical energy used in standard electroconvulsive technique and only a slight increase, 0·5 to 1 second, in the duration of the current flow. Convulsive therapy using such low currents was associated with appreciable diminution of memory defects and with less mental dulling and confusion. Experiments are in progress using an electronarcosis machine utilizing this modified type of current.

Results.—Tietz *et al.* (1945 and 1946) in reporting their 47 schizophrenic cases used the following ratings: An "A" rating indicates recovery with insight, "B" indicates social recovery with retention of some schizophrenic features, "C" indicates some improvement, and "D" denotes failure.

Their results were:

A	. . . .	40·4 per cent.
B	. . . .	36·2 ,,
C	. . . .	10·6 ,,
D	. . . .	12·8 ,,

They concluded that their results with electronarcosis were similar to those obtained with insulin coma treatment, and definitely superior to those obtainable with electroconvulsive therapy.

In the writer's original paper (Medlicott, 1947) a slightly different classification was used, but for the purpose of comparison the results have been reassessed under the same ratings. There were 50 schizophrenics treated, and the results were:

A	. . . .	28 per cent.
B	. . . .	14 ,,
C	. . . .	16 ,,
D	. . . .	42 ,,

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On the surface these results compare unfavourably with those of Tietz *et al.* (1945, 1946), and were below those the writer had previously obtained in 140 schizophrenics with electroconvulsive therapy, which were :

A	. . . .	37·2 per cent.
B	. . . .	15·0 ,,
C	. . . .	19·3 ,,
D	. . . .	28·5 ,,

However, the electronarcosis group contained a higher proportion of prognostically unfavourable cases ; only 17 cases had a duration of illness under six months. While in general the writer's experience did not suggest that electronarcosis was superior to electroconvulsive therapy in all classes of schizophrenia, there was one class, paranoid schizophrenia, in which electronarcosis produced surprisingly good results. For this reason personal experience in treated and untreated cases of paranoid schizophrenia has been reviewed.

In this review paranoid schizophrenia has been accepted as a schizophrenic illness characterized by prominent delusions of a persecutory or mixed persecutory and grandiose type, which are less bizarre and changeable than hebephrenic delusions, and are accompanied by less profound deterioration in personality and habits. Older at the commencement of his illness the paranoid schizophrenic cannot retreat from his responsibilities so unashamedly as the simple or hebephrenic schizophrenic, and he projects on to the outside world the responsibility for his inability to adjust to real life. His delusions and hallucinations form a screen behind which he hides. The clinical picture is relatively constant when once developed, and it is important to exclude many borderline schizophrenic states with good prognoses which show a more vivid and rapidly changing clinical picture. In these borderline states delusions may be prominent, but there is usually gross emotional turmoil and dramatization of conflict. No patient in this series was diagnosed paranoid schizophrenic until he showed a relatively stable clinical picture. The outcome in the following groups of paranoid schizophrenic patients has been assessed, using the same ratings as previously. "C" in non-treatment cases represents patients who have only shown slight to moderate improvement in hospital, and "D" patients who showed no improvement or were worse.

I. Outcome in consecutive female paranoid schizophrenic admissions, 1939–1944 (inclusive)—

(*a*) Patients under 40 years of age at onset of illness—46 cases :

A	. . . .	10·9 per cent.
B	. . . .	—
C	. . . .	2·2 ,,
D	. . . .	86·9 ,,

(*b*) Patients over 40 years of age at onset of illness—60 cases :

A	. . . .	6·7 per cent.
B	. . . .	8·3 ,,
C	. . . .	—
D	. . . .	85·0 ,,

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With the exception of nine cases in group (*a*) and one case in group (*b*) who received convulsive therapy, all these patients received only routine mental hospital treatment. Even allowing for the fact that many patients were already chronic by the time they were admitted, the percentage of "D" ratings adequately indicates the unfavourable prognosis of paranoid schizophrenia.

II. Paranoid schizophrenia treated with insulin subcoma therapy—10 cases:

A	10 per cent.
B	—
C	10 ,,
D	80 ,,

Although it is difficult to draw conclusions from so small a group, it would not appear that subcoma insulin therapy has any effect on the outcome of paranoid schizophrenia.

III. Paranoid schizophrenia treated with convulsive therapy—18 cases:

A	5·6 per cent.
B	11·1 ,,
C	16·7 ,,
D	66·7 ,,

These results are somewhat more favourable, and it is the writer's impression that convulsive therapy favourably influences the outcome in a small percentage of paranoid schizophrenics.

IV. Paranoid schizophrenia treated with electronarcosis—16 cases:

A	37·5 per cent.
B	25·0 ,,
C	12·5 ,,
D	25·0 ,,

In five further cases treated since this paper was originally prepared there have been two "A" results and three "B" results.

In a prognostically unfavourable group of cases these results are very good. Unfortunately the group is too small for one to be dogmatic in one's conclusions, but the clinical impression was that paranoid schizophrenia, if treated during the first year of illness, responds more favourably to electronarcosis than any other form of treatment. In future it is intended to use electronarcosis in all early cases of paranoid schizophrenia.

So far only schizophrenics have been treated with electronarcosis, but its possibilities will be explored in other disorders in which simple electroconvulsive therapy is not successful. Recent work on the treatment of chronic intractable psychoneurotic states with intensive electroconvulsive therapy suggest it may be applicable in such states, and work is being started on these lines.

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Some theoretical considerations.—Electronarcosis presents similarities to both electroconvulsive and insulin coma treatments. The narcosis or coma is preceded by a modified but definite convulsion. If the initial high current is shut off after a few seconds the convulsion is in no way different from that seen with electroshock. In fact Olsen and Dale (1946) recommend that in electroconvulsive treatment split-second timing should be eliminated, and the convulsion produced by a dosage of 200 milliamperes flowing for about ten seconds. In a small series of patients the therapeutic effect of the modified convulsion that precedes the narcosis proper was tried. These were patients suffering from recurrent attacks of excitement whose recurrences had in the past been readily controlled by standard electroconvulsive treatment. Thirty seconds of high current and 30 seconds of reduced current were given at each treatment. These patients responded to these modified convulsions as rapidly as they had done to the standard electroconvulsion. Although it is probable that the modified convulsion at the commencement of electronarcosis has the same therapeutic effect as the standard electroconvulsion, there would seem little doubt that the succeeding electrically maintained coma is essential for the therapeutic efficacy of electronarcosis in more resistant psychotic states such as paranoid schizophrenia. It was, of course, on the belief of the efficacy of an artificially induced coma in the treatment of schizophrenia that Frostig *et al.* (1944) originally used electronarcosis. The present study supports their belief.

The rationale of electronarcosis is as obscure as any other form of so-called "shock" therapy. We know that there is stimulation of the autonomic nervous system which is more prolonged than with electroconvulsive treatment, and Ellis and Wiersma (1945) have demonstrated in animals an increase in circulating thyrotrophic hormone together with hypertrophy of the thyroid, adrenals and gonads presumably due to stimulation of pituitary activity. Either of these stimulating effects may have a beneficial influence in schizophrenia, but in spite of evidence of disturbed autonomic and endocrine activity in this disorder there is no substantial evidence that such changes are the cause rather than manifestations of schizophrenia. Delmas-Marsalet (1942) expresses a similar theory of action for all forms of "shock" therapy, which he has called the "dissolution—reconstruction hypothesis." According to this thesis the coma represents dissolution and the waking from coma reconstruction of psychic activity. Cossa (1947) expresses it thus: "Figuratively, one may say that beginning with a given psychic configuration, dissolution reduces it to scattered fragments. Reconstruction must make use of these same fragments, but according to a new plan. This reconstruction phase does not simply reproduce in reverse the dissolution phase; the various functions as restored present spatial and temporal differences." On this hypothesis it is understandable that electronarcosis producing a disorganization of greater duration and probably more profound intensity than electroconvulsive treatment would be more effective in mental disorders with relatively well developed and resistant psychotic organization such as paranoid schizophrenia. Functional disorganization or dissolution does not require irreversible brain damage, and there is little evidence to support the view that the various forms of "shock"

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treatment produce clinical improvement in direct proportion to the severity of organic brain damage.

SUMMARY.

The technique, manifestations and complications of electronarcosis have been briefly described.

The results obtained with electronarcosis in a small group of paranoid schizophrenics when compared with untreated cases and those treated by subcoma insulin and electroconvulsive therapy were greatly superior.

Electronarcosis presents similarities to both electroconvulsive therapy and insulin coma therapy, and some ideas concerning its rationale as a psychiatric treatment are discussed.

This paper was presented at the September, 1947, meeting of the New Zealand branch of the Royal Australasian College of Physicians. I am indebted to Dr. J. Russell, Acting Director-General of the Mental Hospitals Department, and to Dr. B. D. Hart, Medical Superintendent, Porirua Mental Hospital, for permission to report on the cases treated at Porirua Mental Hospital.

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PSYCHIATRIC TREATMENT OUTSIDE MENTAL HOSPITALS.*

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IN this discussion of psychiatry outside mental hospitals, it is proposed to deal mainly with the field of psychiatry inside general hospitals. The idea of in-patient psychiatric beds in the general hospitals is certainly not new, and was tried out between the last two wars. One of the factors responsible for failure was a lack of effective therapeutics. Thus the comparatively small number of beds available were occupied for periods too long for ordinary general hospital practice, and facilities to ease long-term admission in occupational and social directions were usually lacking. The situation has not substantially changed from that described by Weir Mitchell, who caustically remarked that psychiatrists pleaded for opportunity to treat the early case, but when the plea was granted there was little that could be done. In the last few years advances in both psychological and physical methods have reached a point where certain categories at least of mental illness can be considerably helped by admission to a general hospital psychiatric unit, and be discharged in a period comparable to that usual in general medical wards. A report made in 1943 by the author at Sutton Emergency Hospital, and later, social studies by Brown and Carling, 1945, at the Radcliff Infirmary, Oxford, showed that the six weeks' average stay of the psychiatric in-patients was less than the average for medical patients of a general ward. It was not just a matter of performing a little diagnostic investigation and then transferring the patient elsewhere. In fact less than 8 per cent. of these psychiatric patients were sent to other hospitals. The full figures for a year's admissions are available in the 1943 report.

The in-patient selection field is very wide, and inevitably merges with the mental hospital on one side and the general hospital ward on the other. It has been said, not unreasonably, that mental hospitals are the place for mental illness, and that the innovation discussed trespasses on their clinical inheritance. Writing as one who works in both fields, I do not think this is so great a difficulty as some might believe. Inevitably there must be a little overlapping, but so far as my experience at Sutton was concerned, the majority of those admitted to the psychiatric ward in the general hospital block were not often seen in the mental hospital unless their clinical condition had subsequently altered. One has to remember that except for those who could afford a nursing home, and excepting the very occasional unit provided by a few more far-

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sighted local authorities and their superintendents, there has so far been no specialized hospital service exclusively available to neuroses and milder forms of psychoses. The provision of voluntary status at mental hospitals covers these types in theory, but only partly in fact. The proportion of voluntary patients varies widely, and naturally it is highest where there is adequate treatment, in hospital units that allow of their being undisturbed by acute cases or depressed by mixing with chronic ones. Until such conditions are universal, one still has to reckon with the public prejudice that tends to make a patient choose the general hospital even if architecturally it is lacking in the amenities of the modern mental hospital admission villa.

The *diagnosis and selection* of patients for a general hospital psychiatric ward cannot be done solely within the usual clinical classification, e.g. some depressions are suitable, others far from it. Looking back over the diagnosis of several hundreds of my patients, it was evident that almost every notable psychotic and neurotic type was represented, from subacute schizophrenia to drug addiction. The factors that really enabled certain obviously psychiatric patients to be cared for in a general ward were one or more of the following: (*a*) A well integrated personality prior to breakdown could retain better social control of symptoms than those less well adjusted; (*b*) the illness was of a type in which prompt treatment could control any features likely to menace the patient or others; (*c*) all patients possessed sufficient insight to know they needed care; and (*d*) the course of the illness in those who were psychotic was of moderate severity. It is such general considerations as those that enable some schizophrenics, certain manic-depressives and so forth to be treated in the open general hospital ward with the neuroses without any special precautions, and even on the top floor of the block.

Some psychiatric types found specially suitable are neuroses in which the struggle to adjust and the tension involved has caused manifest physical deterioration. The patient goes downhill in a vicious spiral of combined psychological and physical traumas. In other cases stress in the home or other environment may be so severe that without removal to hospital recovery would be unlikely or long delayed.

Turning from patients who are solely psychiatric candidates for treatment, there is the large group of psychosomatic cases and others where superficially at least the organic aspect seems predominant. Doubtful cases of cerebral tumour, encephalitis or narcolepsy may be referred for psychiatric attention. The proper investigation of various psychosomatic pains can often be assisted by the backing of general hospital laboratory and radiological facilities. None the less, a vast amount of laboratory and such like investigation could eventually be cut out if the student was taught the characteristic features of psychogenic pain as carefully as the physical pains of pleurisy or renal colic. Diseases such as thyrotoxicosis, peptic ulcer, migraine, asthma, colitis, rheumatism, cerebral trauma, are amongst those subject to greater or lesser degree of emotional aetiology. In some of the above, investigation will make it clear that the whole syndrome is fundamentally neurotic without demonstrable organic lesion, as in the gastric, cardiac, dermatological neuroses; while in others it will be found that emotional complications are aggravating undoubted organic

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illness. In the latter we reach a borderline group that so far as selection is concerned are often better treated in an ordinary medical ward.

It is the presence of many better adjusted personalities in this form of work that swells the recovery rate of the physically treated patients compared with results for the average certified mental hospital patient, though on paper they might all look much the same.

Many of the types mentioned are not usually seen in mental hospitals, though they have masqueraded frequently in medical and surgical wards under indefinite or tentative diagnoses. One effect of general hospital psychiatry is merely to grant a frank recognition of the status of such patients. It is clear that the responsibility for selection of patients for admission should be on a senior psychiatrist. The soundness of his out-patient recommendation for the various forms of in-patient status will mainly determine such later complications as premature departure of the mental hospital voluntary patient, or the upsetting of a general hospital unit by noisiness, interference, or suicide, and so on, with possibly subsequent certification in the observation ward.

Where case selection is on these lines, a specimen unit, as it were, of 30 beds will be found to be composed as follows: Rather more than half the patients are neuroses and rather less than half psychotic in type. About half require psychological treatment and investigation, and half some form of physical therapy. At any one time facilities are needed for approximately eight patients on E.C.T., four on insulin comas, another four on modified insulin, two or three on prolonged sleep courses, and very occasionally a leucotomy. Other brief forms of psychotherapy are often needed to complete the treatment of those who have had the physical methods. Such a ward obviously is quite unsuited for patients requiring prolonged psychotherapy or psychoanalysis. If this is indicated, discharge to the out-patients' clinic is arranged. Though only a small proportion of these hospital cases are suitable for analytical technique, there is much that can be done for them psychologically.

The in-patient situation often produces excellent diagnostic information about the patient's personality and its trends, especially after the initial strangeness has worn off, and the patient is more or less being just himself. Assisted by reports from nursing staff, one soon has a better picture in a relatively short time of what kind of a person the patient really is, and many hitherto doubtful features and diagnoses can be settled. When general factors such as these are linked with special methods such as narco-analysis, abreactive techniques, and physical forms of treatment, then the time required for psychotherapy is shortened, and if proper medical staffing allows, it can also be concentrated. Because a majority of patients labour under faulty personal attitudes to occupational, marital, sexual or domestic matters, or because they are subjected to over severe stresses in these fields, it is possible to bring much relief by essentially practical readjustments in these aspects of life, by group therapy, the social club, the resettlement officer of the Ministry of Labour, in addition to the all-important personal interview.

All this is no substitute for such as should properly be subjected to free associative technique. Yet with and without physical treatment, the policy just mentioned led to the recovery of approximately 40 per cent. of civilian

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patients, and the improvement of 40 per cent. more in a psychiatric ward on the general side of Sutton Emergency Hospital, after a follow-up of two to twelve months. No group or social club facilities were available at that time.

There are a few practical points in *administration* and *treatment* that are of particular importance for these patients. Even in this type of work the protection of a patient may become an over-riding consideration. The responsibility is the greater since there is no coverage from the mass of regulation and procedure that helps to ensure the safety of the mental hospital case. If general hospitals recognize their own clinical limitations, no such procedure is necessary.

Normally the patient's liability to suicide is settled in the out-patient department or at in-patient consultation in a general ward. By way of illustrating the situation as seen in this type of practice, the records of some 65 general hospital cases who were referred to me from medical wards for psychiatric opinion after attempted suicide in the past fourteen months were re-examined. Of all cases, two-thirds were female, and ages spanned from 16 to 80 years. The majority were between 20 and 40 years of age. In over half, abnormal and unstable previous personalities could be established. Had subsequent interviews been possible, this number would doubtless have been higher. Over half the number used drugs, especially luminal or aspirin as the method, and a fifth employed coal gas. Definite violence was only used by 6 male patients. The most common diagnosis was that of depression, mainly reactive in 21 patients, mainly endogenous in 7; next in frequency were neurotic states, of whom 14 were hysterical and 4 anxious. The remainder were composed of 10 psychopathic personalities, 6 epileptics, 2 schizophrenics, and 1 paranoid psychosis. Male psychotic and psychopathic personalities made the more violent and drastic attempts. All social grades were represented. In nearly a quarter of these cases previous attempts had been made, more especially by hysterias and hysterical psychopaths. Apart from personality defects the main precipitating causes were marital, economic, occupational, and due to organic disease, in that order of incidence.

It is in this type of work that one may sometimes meet the better integrated personalities, who can so minimize symptoms and retain an outward control that attempted or successful suicide is perhaps the first and last visible evidence of breakdown.

More than half the patients were eventually discharged home with or without recommendation for out-patient treatment and various social adjustments. Ten required observation ward care, but others went voluntarily to special hospitals, neuroses centres, nursing homes, etc.

Despite previous consultation, in these days of few beds and long waiting lists, a patient may have altered for better or worse between the time of out-patient interview and admission to hospital. One may have to decide whether to retain or to send to the observation ward a case of good prognosis, though relatively acute, possibly confused, noisy or potentially suicidal. Patients should not be retained in the general hospital unless there is reasonable prospect of controlling symptoms within an hour or so of admission, and unless the diagnosis is sufficiently clear to warrant sacrificing much of the customary

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case-taking and investigation. Delay may open the door to suicide, or to manifestations of mental illness detrimental to the progress of other patients. To shut the noisy patient in a side room is no answer, since the idea soon spreads that the ward is becoming a mad-house. If one has to deal with the psychiatric emergency in a general hospital, it is necessary to do as the general hospital does and operate or act on minimum data. For example, prolonged sleep—using quick-acting barbiturates such as sodium amytal, or by electro-convulsive therapy are particularly useful. Narcosis is suited for very acute hysterical and anxious states, and where E.C.T. is not possible, for some agitated depressive and mildly manic conditions. The concentrated use of E.C.T., e.g. one to two fits a day for two days followed by others more spaced out, should settle any affective disorder that is remotely possible for a general hospital. A preliminary course of either of the above can be employed to improve schizophrenic cases temporarily, especially those liable to impulsiveness, while insulin dosage is being built up to coma levels.

It is most important that a good atmosphere or state of morale be maintained, and it is worth remembering that the fundamental attitude of a general hospital psychiatric ward is the reverse of a ward full of certified psychotics. In the latter, acute disturbances may pass almost unnoticed, and even suicidal attempts elicit little reaction. In the former, the neurotic group over-react to and are over-aware of the most modest environmental stimulus. Anyone who has experienced war emergencies in both mental hospitals and neuroses centres will know how great is the difference. Exhibitions of hysterical, agitated, anxious or schizophrenic symptoms should not be allowed to run unchecked. They are apt to spread, with disastrous effect on the progress of other neurotic patients. Occasionally a few will take the view that having seen what nervous illness can really mean, their own complaint must be of little account. They endeavour mentally to pull themselves together and try again. Such talk may be genuine, or it may be a polite rationalization to facilitate their own discharge.

It is suggested that short periods of admission with a steady turnover of patients is the most useful policy. From three to seven weeks is enough for the majority of patients, but this can only be done successfully if those in charge are prepared to use a full range of treatment consistent with the varying needs of their patients. There is no place in this type of work for whole treatment programmes run solely on a particular ideology, psychological or physical. Collections of chronic patients are to be avoided, unless admitted for some limited investigation or to tide them over a difficult phase. One should avoid admitting many cases of hysteria at any one period.

Concerning one's relations with the law, the situation is similar to but not identical with that of any general practitioner treating the psychiatric case. The relieving officer and the observation ward are called on if required. Technically cases that are certifiable may not be retained without the sanction of the Board of Control. Psychiatric patients very greatly appreciated the complete lack of any legal formality or signing of papers on admission or discharge, and it is hoped that this freedom will continue. Administratively I never felt the need of an alteration. Provided one is careful to keep case

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selection within the limitations of its own sphere, legal aid should not be necessary and only rarely the assistance of the relieving officer. It follows that administratively as well as therapeutically so much depends on selection and therefore diagnosis in this regime.

In addition the general hospital psychiatrist is usually called to consult in general wards of his own and maybe other hospitals for diagnosis and disposal. In such work the whole field of psychiatry can be covered, and in differential diagnosis no mean part of medicine as well. The range of experience required is considerable. The general psychiatrist, like any general surgeon, requires to keep sufficiently in touch with general medicine, and not only with neurology, to maintain efficiency in his own work.

In conclusion, it is suggested that the use of general hospital beds for psychiatric purposes is a further step to fulfilling the needs of one section of a socially heterogeneous group of illnesses. Probably this type of psychiatry will do much to hasten public acceptance of neuroses and psychoses as forms of illness, and thus ease the stigma which hampers many aspects of the subject. In the long run any relief from public prejudice will help the mental hospitals to cater for a wider in-patient field than the majority do now, especially when these hospitals have been more radically adapted for different grades of mental illness. In the meantime there are many undoubted sufferers from psychiatric illness such as the psychosomatic types, not requiring the more elaborate setting of a mental hospital in which to recover, who will not consent to in-patient treatment unless on equivalent social footing with the medical case. They may be prepared to face the realities of their maladjustments in the confidential atmosphere of the consulting room and in the sympathetic milieu of group therapy, but they are unwilling to advertise the nature of their disorder to a public of limited understanding by being admitted to the mental hospital, even when full treatment is available.

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OBSERVATIONS ON THE ELECTRICALLY-PRODUCED EPILEPTIC CONVULSION. PART II: PUPILLARY PHENOMENA IN NORMAL AND PATHOLOGICAL PUPILS.

By R. KLEIN, M.D.Prague, and D. F. EARLY, L.R.C.P. & S.I., D.P.M.

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THERE are three particular pupillary movements in the course of the electrically-produced epileptic fit: dilatation during the convulsion, constriction in the post-convulsive stage, and spasmodic dilatation towards the final stages of the post-convulsive stage. The pupillary dilatation in the convulsive phase is identical with that found in the spontaneous epileptic fit, where it is generally considered as an expression of sympathetic activity, either the consequence of a general (Bumke, 1914) or of a focal cortical excitation (Foerster, 1936; Penfield and Erickson, 1941), or, an opinion held more recently, due to a hypothalamic mechanism (Delay, 1946).

Of special interest is the spasmodic pupillary dilatation. It is invariably associated with general motor reactions of the skeletal muscles. Whilst the patient is unconscious and motionless sudden muscular contractions occur, either of single muscles or of muscle groups, or of a general nature. Simultaneous with these pseudo-spontaneous movements a marked dilatation of the pupils occurs, and the light reflex, if previously present, disappears; when the movements cease the pupils contract to their previous size. There is either a succession of such waves, or a continuous muscular restlessness which passes into a semi-conscious state. The general physiological setting in which these reactions occur is that of a deep sopor. Corneal and light reflexes may or may not be present, and the skeletal muscles may either be flaccid or in a state of rigidity. Deep reflexes are present, but there is no response to painful stimuli. No pupillary reaction is seen when the movements are produced passively or by electrical stimulation of muscles or muscle groups.

Changes of pupillary size associated with muscular activity have been described by Redlich (1908). This author described dilatation of the pupils which he attributed to general cortical excitation following heavy muscular exercise, especially in hysterics and epileptics. The conditions in our observations are obviously different; the physiological setting and the character of the movements of the skeletal muscles indicate a subcortical rather than a cortical mechanism. The main obvious participants in this synergic pattern are the voluntary skeletal muscles and the autonomic muscles.

To decide whether the dilatation of the pupils is due to sympathetic excitation or to loss of parasympathetic tone, atropin and cocain were instilled into one eye of a number of patients before E.C.T. During the pseudo-spontaneous movements no further pupillary dilatation was observed in the eye treated with

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atropin, whilst the pupil in which cocain was instilled showed a definite enlargement. This indicates that the pupillary dilatation is due to loss of parasympathetic activity. The paroxysmal synergic action of voluntary muscles and of pupillary enlargement contrasts to the resting tendency to pupillary contraction. This contraction was frequently almost pin-point and was present after cocain instillation; it is apparently due to sphincter activity. In both of these conditions therefore a well-defined motor pattern exists, during which voluntary muscles and parasympathetic eye muscles are in an inverse functional relationship. The pupillary dilatation in the convulsive phase fits into this pattern; as in the post-convulsive movements there was no pupillary enlargement after atropin instillation, whilst the pupil treated with cocain dilated.

This pattern of autonomic and voluntary muscle activity is not specific for the epileptic fit. In insulin coma when the skeletal muscles are inactive the pupils are small. Waves of active movements similar to those seen in the epileptic phase appear, with simultaneous enlargement of the pupils. One patient during coma slowly lifted his right arm at irregular intervals, and this was consistently accompanied by marked dilatation of the pupils, which returned to their small size immediately the arm movement had ceased. Inactivity of skeletal muscles and tendency to pupillary contraction can be found in conditions of unconsciousness whatever their aetiology. There is some indication that this synergy is physiologically preformed. There is contraction of the pupils during sleep, a satisfactory physiological explanation of which has not been found. The relations to the motor pattern which we observed are obvious. It has been noticed that a number of concomitants of sleep are typical of parasympathetic activity. This would give the relation we found between voluntary and autonomic muscles a more general character.

With regard to pathological material, five cases of Adie's pupils with a depressive picture and four cases of Argyll Robertson pupils in patients with general paresis and restlessness were treated by E.C.T. The following observations were made:

Group I: Cases of Adie.

Case 1.—The right pupil was slightly larger than the left. Light and convergence reaction normal in the left eye. On the right there was a slow contraction to light, but only in the dark; convergence showed prompt contraction with delayed dilatation; in the dark dilatation of the pupil was much delayed. On the left reactions normal. Good dilatation after atropin. Knee-jerks on both sides diminished; less on the right. Ankle reflexes not obtainable. W.R. negative.

Case 2.—Left pupil much larger than right. On the left poor reaction to light; tonic convergence reaction. In the dark left pupil enlarged after long delay. Pupils enlarged well after atropin. Ankle reflexes absent. Serological reactions negative.

Case 3.—Left pupil slightly larger than right. Both pupils react sluggishly to light. Tonic convergence reaction on both sides. In the dark delayed enlargement. Both pupils enlarged well after atropin. Serological reactions negative.

Case 4.—Left pupil larger than right. Very poor reaction to light; more so on the left. In the dark difference in the size more marked. Tonic convergence reaction on both sides. After atropin both pupils dilated well. W.R. negative.

Case 5.—Right pupil larger than left. Right pupil reacted upon light only in the dark; enlargement delayed in the dark; convergence reaction tonic. On the

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left normal reactions. Good enlargement on both sides after atropin. Knee and ankle reflexes absent. Serological reactions negative.

All of these cases except Case 5 were female.

Group II : Argyll Robertson Pupils.

CASE 1.—Very small irregular pupils with no light reaction. Very active convergence reaction.

CASE 2.—Small irregular pupils with little light reaction and good convergence reaction.

CASE 3.—Right pupil dilated. Left middle size. On the right no light reaction and poor convergence reaction. Both reactions better on the left.

CASE 4.—Small irregular pupils with poor light and good convergence reaction.

In the first group, consisting of cases of complete and incomplete Adie syndrome, no alteration of the pupillary size in the affected eye occurred in any of the phases of the epileptiform fit. In the Argyll Robertson pupil, on the other hand, the pupils enlarged during the convulsive stage and during the post-convulsive movements of the skeletal muscles ; they returned to their previous size or became more contracted in the quiet post-epileptic phase. The enlargement was least in the case of very small pupils with total absence of light reaction.

We found that the dilatation and contraction of the pupils in normal eyes in the course of the epileptiform fit was part of a synergy of subcortical origin. In contrast to the normal eye, the tonic pupil remains fixed. Under normal conditions the autonomic eye muscles of the tonic pupil react, though slowly, to peripheral stimuli. There is no interruption of the peripheral reflex arc. It can therefore be concluded from the absence of normal pupillary movements during the fit that central impulses of the order described fail to be transmitted to the efferent system. It has been a matter of speculation whether the disturbance in the tonic pupil is of peripheral origin (Schleie, 1940 ; Lowenstein and Friedman, 1942), or of central, specially hypothalamic origin (Foster Kennedy and co-workers, 1938; Lowenstein and Friedman, 1942). Our observations indicate that a sub-cortical mechanism is involved.

Argyll Robertson pupils enlarge in the phases of muscular activity and contract in the quiet phase ; the excursion of the pupillary movements is less than in normal eyes and the enlargement is about the same as that produced by atropin instillation into these eyes. As has been repeatedy pointed out (Bumke, 1914; Behr, 1924), contracture of the sphincter muscle may set a limit to dilatation. It is the general opinion that the functional lesion in Argyll Robertson is in the neighbourhood of the Westphal-Edinger nucleus, damaging the afferent fibre system (Behr, 1924; Bumke, 1914; Magoun and co-workers, 1935, 1936; Merritt and Moore 1933 *et al.*) Our observations do not contradict this assumption, but they do not, however, support the view that the Westphal-Edinger nucleus might be isolated altogether (Spiegel and co-workers, 1936, 1944).

SUMMARY.

In the epileptiform fit produced by electric shock the enlargement of the pupils during the convulsion is followed by contraction in the post-epileptic phase. In this phase spasms of pseudo-voluntary movements in the skeletal

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muscles occur with simultaneous dilatation of the pupils. This is a subcortical motor pattern, in which parasympathetic eye muscle and skeletal muscles are in inverse functional relationship. There is some indication that this motor pattern is physiologically preformed.

In tonic pupils no pupillary change could be seen in any of the phases of the epileptic fits. This suggests that subcortical impulses which in the fit are normally associated with the activity of voluntary muscles were not transmitted to the Westphal-Edinger nucleus. In cases of Argyll Robertson such transmission took place, since pupillary dilatation and constriction could be observed during the fit.

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EXPERIMENTS IN THE IMPROVEMENT OF READING IN A GROUP OF EDUCATIONALLY SUBNORMAL BOYS.

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THIS paper attempts to describe in detail the results of an educational programme aiming at the improvement of reading (accuracy, comprehension and speed) in a class of high grade educationally subnormal boys who were all in one or the other respect unsuccessful readers. For the purpose of this paper an unsuccessful reader is defined as a reader whose power of word recognition, of fluency of reading or of understanding is below the level expected from him. It has been assumed that this level is indicated by the mental age, though it has been kept in mind that the result of a verbal intelligence test need not be the final decision as to the intellectual capacity of a child.

Reading, being a cognitive function of the whole personality, should never be considered in isolation and as a mere problem of technique. Personality factors have an immense influence in adopting well distinguishable attitudes towards reading, ranging from complete rejection to an unhealthy craving for reading over a whole variety of reading difficulties concerning word recognition, speed and comprehension. Though these difficulties are very often of a mere technical nature, their "adoption" by a child and continued existence is a frequent consequence of certain emotional difficulties, which need attention either previous to or concurrent with remedial reading training.

As it was believed that difficulties in reading were largely due to a deeply rooted resistance on the side of the children, no attention was paid to any existing physical or neurological shortcomings (auditory, visual deficiencies, etc.). It was felt that Hegge's view (1) was correct who pointed out that nobody had "so far been able to demonstrate any specific factor as highly potent in producing a special reading disability," and that "the beginner at reading commits the entire variety of known reading errors." He concluded that the special reading disability cases are simply those who do not eliminate these error tendencies in the process of training.

Whilst, of course, many of the boys in the particular class under review were not reading-disability cases in the orthodox sense, their slow or non-existent progress in word perception, speed and comprehension was considered to be due to the same constellation of factors responsible for the failure of the typically unsuccessful reader. Initial failure, due to a variety of causes, undermines the child's self-confidence and induces him to find things twice as hard as in ordinary circumstances. A discouraged child might attempt

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to find excuses for his shortcomings in real or alleged faults of his environment. His resentful, critical and hostile attitude will make the schooling task more and more difficult for all concerned. The child's resentment will perhaps express itself in overt acts of misbehaviour, turning into a behaviour problem, but he may also very often fasten on the various difficult phases in the reading process without being able to get past them. The child does not succeed in reading then because the ability to read is a manifestation of society, and forces him into nearer contact with it than he can endure or permit. Reading failure may therefore very often be merely another symptom of maladjustment.

This is, in short, the point of view taken by the present paper, and the investigation described furnishes an example of a possible approach which is of necessity still of rather an experimental nature.

The Experimental Group.

The investigation took place in a senior class of the biggest residential special school in England. The school is part of an institution under medical supervision, and progress in school is intimately linked up with the acceptance or rejection of the institution environment. This offers in many ways an ideal opportunity of experimenting under controlled conditions, the children living on the premises and not being directly subjected to any out-school influences except to those of the institution itself. More will have to be said about this aspect later on.

Owing to the long duration of the experiment it was impossible to keep the composition of the class identical throughout, and many boys had left and had been replaced by newcomers by the time the investigation was concluded. The class consisted during the two and a half years, over which the three different phases of the experiment were spread out, of 39 different boys. Their I.Qs., measured on the Binet Test (Terman-Merrill Revision), ranged from 92 to 55 with an average I.Q. of 71. The Intelligence Quotients of the thirty boys taking part in the first phase of the investigation and also in the second (minus five school-leavers) ranged from 92 to 55, with an average of 73. The Intelligence Quotients of the 20 boys participating in the third phase of the experiment are well comparable. The test gave them ratings between 92 and 63, with an average of 74. Of these 20 boys, eleven boys had taken part in the first two phases of the investigation.*

The chronological ages of the boys at the beginning of the experiment ranged from 12 to nearly 16, most boys being between 13 and 14, whilst those of the boys at the beginning of the third phase of the investigation ranged from 12–7 to 16, with an emphasis on the fifteens.

To limit the description of this group to the single heading "Mentally Defective" and to the results of tests is inadequate, because this would imply a far more homogeneous character of the group than was actually the case. Generally speaking, the real problem in working with these children was not so much the inferiority of their intelligence, but the inferiority

* These eleven boys, who participated in the whole of the experiment, rank in all tables and graphs in the same eleven places. As the remainder of the class changed, attention to names is important when comparing test results in the different tables.

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of libido. Thus, their lack of directed drive, marked inability to adjust successfully to their environment, immature emotions, pronounced feelings of anxiety and insecurity, in short their inferior emotional personality pattern were found to be a far greater influence on their reading attitude than their inferior intellectual endowment, to which adequate attention had been given in taking the mental age as an index of expectancy. As they were immature in every aspect, the problem of teaching this type of child assumed characteristic new features. Since it was wholly unjustified to isolate the intellectual function from the personality as a whole, the immense bearing of emotional influences on the cognitive faculties had to be considered when designing a training programme aiming at the development of this side of the educationally subnormal personality.

The inferior emotional pattern, characteristic for all boys of this group, had led in many cases to friction with society. Many boys were Court cases, had been thieving and housebreaking, had proved to be " beyond parental control and in need of care and protection," had been persistent truants and were definitely maladjusted. Their relationship to their families was in many cases far from being satisfactory, and proved to be a constant source of irritation and unhappiness.

The institution, which is under the supervision of a psychiatrist, has been very successful in the elimination of the worst features of maladjustment by suitable psychotherapeutic treatment. The children shed soon after arrival much of their conscious and overt feelings of resentment, cease to be serious behaviour problems and begin to show a certain degree of self-confidence. The feeling of security they have thus acquired in the sheltering and protecting atmosphere of the institution does not of course entirely do away with the consequences of years of maladjustment, but provides an adequate starting point for remedial work of all types. School work of the experimental character described in the following pages would be impossible but for the soothing and encouraging influence of the institution.

The experiment consisted of three different phases devoted to three different aims and was spread over a period of two and a half years. The first phase (Jan., 1946–June, 1946, 6 months) was solely devoted to the improvement of word perception. It was immediately followed after the summer holidays by the second phase (Sept., 1946–Dec., 1946, 3½ months) aiming at the improvement of comprehension in reading. The third phase (Feb., 1948–April, 1948, 3 months) followed after one year's interval, during which the ordinary school routine was carried out, and was designed to increase speed of comprehension and to clarify some points having arisen in course of the previous work.

Phase I: Improvement of Word Perception.

Plan of Experiment.

As the lack of ordinary ambition and drive was such a conspicuous shortcoming in the psychological make-up of these boys, means had to be found to spur them sufficiently to put an extra bit of effort into the proposed work. Things were not made easier by the fact that the work was to deal entirely

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with reading and was to take up a considerable part of the school time, th emphasizing the very subject which had been for many boys a stumbli block in the past and had been associated with discouraging failures.

The hypothesis underlying the whole experiment was the experimenter conviction that these boys were fundamentally really extremely keen to lear to read, and that only repeated failure had prejudiced them against reading thereby lowering their efficiency. It was the author's opinion that all thes boys had developed more or less an inferiority feeling regarding their scholasti and other attainments. Many of the boys disliked reading only because the had either never been able to acquire an adequate reading technique, or ha not sufficient knowledge to utilize their reading. They were averse t attempts at teaching because they had been preconditioned by initial failure, and because they found it beneath their dignity to be seen reading " baby-books," or to have to admit to themselves that they were not far off the detestable reading stage of " The cat sat on the mat."

Much of their misbehaviour seemed to be due to an attempt to over-compensate in some respect, and there was no reason why they should not b able to over-compensate for their many other shortcomings in the field of reading. Inability to read well or to understand well was of all academi work the most conspicuous failure. It was, moreover, of all schoolwork the most attractive subject, opening up, as it were, the gates to such desired pastimes as reading the " comics," " murder stories," or the sport pages of newspapers.

A method had to be adopted which, by giving a feeling of fluency in reading of other than " baby-stuff," would encourage those readers who had stopped or slowed down in their progress after having acquired the rudiments of a technique to pursue reading with renewed energy. As the children in question were " exceptional " in many ways, the method to be used had to take particular note of the type of child to be taught, and methods which hav proved successful in other schools were not necessarily suitable in this particular case.

The method adopted by the author and described in the next section was that of a " syllabication drill." It consisted in short of practising the technique of splitting up long and difficult words into the component parts of the syllables. There was no need to understand the meaning of these words as long as accurate pronunciation was practised. Indeed nonsense words were of great help.

The success of this method was, in the author's opinion, mainly due to the psychological issues successfully tackled thereby.

1. It was an entirely new method for the children, unaffected by prejudices owing to previous failures. It started on an absolutely new basis, and the fact that the method used, for example, ungainly typewritten and duplicated sheets instead of the brightly coloured modern books, may have been rather an advantage, as no " conditioned reflex " was liable to occur.

2. It was a simple and merely mechanical method which did not ask for " Comprehension " " Now, tell me in your own words what you have read. What does it all mean? " and taught a few simple rules of pronunciation easily

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emembered. The sole task was that of expressing a printed symbol in sound, nd the incomprehensibility of the words prevented to a large degree involun- ry and detracting associations which a text or words within their under- tanding might have caused.

3. Another factor, not to be underestimated, was the constant feeling of satisfaction and achievement as the result of each individual lesson. A mentally deficient child is generally unable to plan beforehand and to work ahead, with the results forthcoming only after some considerable time. He wants to see the fruits of his efforts at once, and in order to stimulate him to renewed efforts they should not be too meagre and insignificant either. Having learnt in the syllabication drill, the pronunciation of a long and, for him, meaningless word like "graphological" filled him with more satisfaction than the learning of an ordinary word like "chimney-sweep" the meaning of which is not mysterious.

The charge that a method like the present one is not "purposeful reading," unattractive to the children and not to be encouraged therefore, is not valid. After all, "purpose" is something different for different people, and whilst the task of learning the pronunciation of nonsensical words may be repellent to an ordinary child, the educationally subnormal child with his inferiority complex will snatch eagerly at that very task, which seems to bring him nearer to the coveted knowledge others possess. For him the reading of nonsensical words is "purposeful." After all, it is well known that uneducated persons with an "intelligence complex" use a large and only half-digested vocabulary.

4. The mere fact of being able to read "long words" or even only of being expected to read these "grown-up words" was an immense incentive to these senior boys. The method, therefore, circumnavigated the problem of the "baby-books," the vocabulary of which would have been within easy reach, though the content and appearance of these books would have acted as a deterrent.

As the influence of maladjustment, which was thought to be primarily responsible for unsuccessful reading, was successfully being treated by living in the sheltered security-providing atmosphere of the institution, this obstruction in the learning process had been more or less eliminated. There remained then mainly the great obstacle of the child's own lack of self-confidence, the distrust in his abilities, his intellectual inferiority complex. It was here where the new mechanical drill of syllabicating long words gave them security in the comforting feeling of achievement. They became very rapidly familiar with the act of reading, which was quickly turned from a source of inferiority feelings into a source of pleasure. The creation of this psychological situation was thus in reality only the preliminary step for the subsequent phase aiming at the improvement of comprehension and speed.

THE SYLLABICATION DRILL.

The drill used machine-duplicated pages with groups of words arranged and partly made up according to certain phonetic rules (3, 7). The immediate technical aim of the drill was to make the boys understand the phonetic value

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of certain letter combinations and syllables, and to teach them to pay meticulous attention to the accurate splitting up of words into syllables and to their pronunciation. This technique was developed initially on the basis of nonsense-words, with special emphasis on the study of word endings. This approach had been selected by the author because of the observation that the children, when spelling out an unknown word, often finished, after a correctly pronounced beginning, by a seemingly haphazardly added ending with little regard to the actual spelling. This seemed partly due to the sometimes phonetically rather irregular composition of the end syllables, partly to the mental exhaustion of the reader, who appeared not to have sufficient energy left half way through the word. Both difficulties were done away with by supplying the reader with the knowledge of the correct pronunciation of end syllables, whose "Gestalt" became familiar by repetition. The recognition of these wholes after having spelled half way through a word secured a satisfactory conclusion just in the very moment when the staying power threatened to give way.

Besides the endings, sound combinations of all kinds were practised. Following is a short sample, demonstrating the basic principles of the approach :

This example is built round the word endings –tion, –sion. Nonsense words and real words are used alike.

mo–tion	fi–sion	mo–fi–sion	mo–fi–mo–tion	
na–tion	le–sion	na–le–sion	mo–na–le–sion	mo–na–tion
ra–tion	mi–ssion	ra–mi–ssion	fi–mo–ra–tion	molefication

Or :—

pho–no–lo–gy	pho–to–mo–tion	mo–no–lo–gy	bi–o–gra–phy
pho–to–gra–phy	gra–pho–lo–gy	radiography	radiology
pho–no–gram	radiogram	marconigram	monogram

During the 21 weeks of this syllabication drill each boy received about 56 drill lessons in a small group of ten boys. The method was used for all children throughout this experimental phase except for a small group of ten very poor readers who had to be started off on a phonetic basis before changing over to the syllabication.

In addition to this all boys had at least 39 hours of private silent reading of educationally supplementary readers. This means that each boy spent about one quarter of his school time in reading.

Special note must be made of the atmosphere of general enthusiasm and energy kept up by the class throughout the whole length of this—for me—very tedious part of the experiment. The boys were definitely keen on proving to others and themselves that they were not "dopey" or "barmy," and were very grateful of being given the opportunity "to get level with the outsiders."

The syllabication method combines elements of the phonetic and the sight-reading method. The syllables are learned by sounding and combining the letters where possible, whilst the irregular syllables are recognized by sight from the beginning. The syllables, forming a whole, are soon familiar by sight, and then need no previous dissection into sounds. Thus, when encounter-

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ing a new word, the child is not helpless as it often happens when he has been brought up on a mere "look and say" method, nor is he handicapped by phonetic irregularities. Splitting up the word into its syllables brings him at once face to face with the familiar syllables which he knows in other connections and the task of reading the unfamiliar word is largely facilitated.

Seen from a purely academic point of view the advantage of employing this particular method—apart from those psychological considerations listed above—is mainly this:

Though it must be recognized that the correct pronunciation of words far above the level of vocabulary ever likely to be used by these boys is not an advantage in itself, it must not be forgotten that the acquisition of fluency and accuracy will be of benefit to all reading. Comprehension of reading matter is definitely facilitated if the reader is able to keep up a moderate speed of reading without stumbling over difficult words. Even an unknown word does not represent the same obstacle if it is taken in one's stride, so to speak, and has not to be spelled out laboriously, forgetting meanwhile what has preceded.

The acquisition of meticulous accuracy and attention to detail, a necessary consequence of the drill, made its effects felt on all levels of reading. Even many of the "good" readers had proved in the past to be extremely inaccurate, interpolating and omitting syllables and letters and substituting different words, which very often led to misunderstandings or even complete reversals of the meaning of the sentences.

Achievements.

The experimental group of thirty boys was tested in the mechanics of reading on the Burt Test at the beginning of the intensive drill period in January, at the end of it in June and half a year later in December. During the latter half of that year no drill in word perception was given.

Table I sets out in detail the achievements of the thirty boys during that time. As will be observed, there was a great increase in the accuracy of word perception after the re-test in June. The syllabication drill had obviously raised their fluency considerably, some boys adding up to three years to their previous level during the comparatively short time of six months. In the second half of the year when the drill was completely discontinued, only a few boys added perceptibly to their fluency, many remained more or less stationary, and a few dropped a few points, though never back to their original starting point. This second half of the experiment shows, therefore, on the whole the tendency of the educationally subnormal boy to be slow in his progress when left to his own devices, whilst he is able to accelerate his working pace considerably if under tuition.

The re-test in June indicated that two boys had improved during the six months' drill by more than three years, ten boys had added to their original Reading Age between two and three years, twelve boys had gained between one and two years, and six boys had improved by between half a year and a year. None of the boys had improved by less than the six months expected

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from ordinary children, though it is obvious that without the drill quite a good number would have added less than the six months to their Reading Age. This becomes even clearer when comparing the achievements of these six months with the test results of the previous six months when no training was given. This same group—less five boys—showed only an average gain of 0·4 compared with the average gain of 1·8 during the experimental period. The most successful reader in the pre-experimental period improved by 1·6 years, whilst the greatest achievement recorded now was a 3·4 years' gain. The poorest reader of the pre-experimental period had lost 0·5 months, whilst the poorest reader of the experimental group maintained during the drill a steady progress, resulting in a gain of 0·6 months.

The Reading Ages in Accuracy measured by the Burt Test varied from 5·7 to 11·6 at the beginning of the experiment. In June after the conclusion of the drill, the lowest Reading Age was 6·5, the highest 13·9.

The graphic presentation of the results of this first part of the experiment (Fig. 1) shows with greater lucidity than the figures some striking facts. It

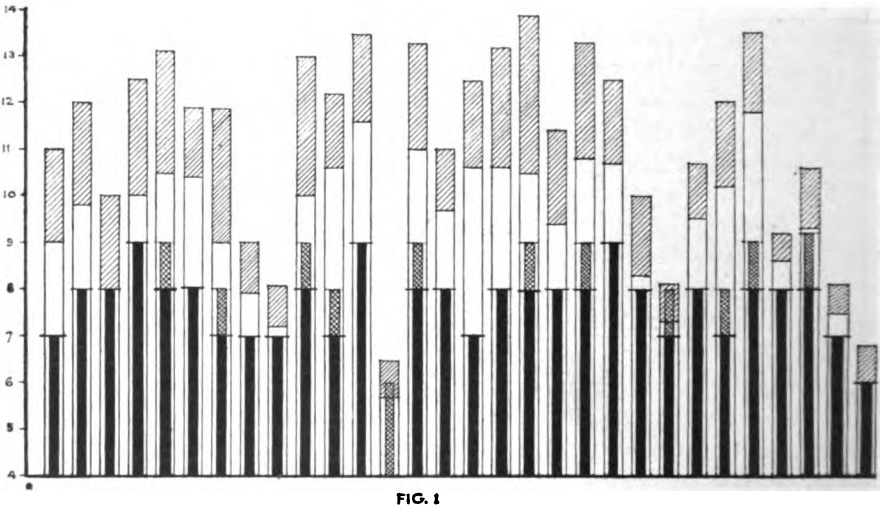
LEVEL OF ACCURACY AT BEGINNING OF SYLLABICATION DRILL
GAIN IN COURSE OF DRILL
LEVEL OF COMPREHENSION AT BEGINNING OF DRILL
INCIDENTAL GAIN DURING DRILL

FIG. 1

points first of all to the great disparity between the well-developed technique of word perception and the badly developed Comprehension of Reading as measured by Burt's Graded Direction Test. It is, of course, true that this group furnishes an exaggerated example of these gaps of up to four years, because the reading drill had more or less artificially raised the ceiling of reading accuracy, which would otherwise not have taken such astronomical features. Still the tendency towards great gaps between Comprehension and Accuracy was noticeable even before the reading drill began, and a glance

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on the presentation where the January position is also indicated shows several cases with up to three years' differences.

The graph shows further very clearly that none of the thirty boys involved was able to score a higher comprehension age than nine despite their fluent reading. The discussion of this feature will, however, be better postponed to the description of the second part of the experiment.

TABLE I.—*Showing the Gains in the Mechanics and Comprehension of Reading During the Period of One Year (Phases I and II).*

	Mechanics of reading in decimals.		Comprehension of reading in years.	
	Jan.–June.	Sept.–Dec.	Jan.–June.	Sept.–Dec.
Kenneth V—	2·0	0·4	0	2 (3)
Alfred P—	2·2	0·9	0	1 (2)
George P—	2·0	1·0	0	2 (3)
Jack W—	2·5	0·2	0	2
Edwin O—	2·6	—0·3	1	0
Leslie B—	1·5	0·4	0	1 (2)
Ronald W—	2·9	—0·2	1	2 (3)
Joe P—	1·1	0·2	0	2
Cecil A—	0·9	0·6	0	1
Leslie A—	3·0	—0·1	1	0
Joe K—	1·6	—0·2	1	1
Peter A—	1·9	—0·4	0	2 (3)
Trevor B—	0·8	0·5	..	1
Arthur C—	2·1	0·1	1	1 (2)
William E—	1·3	1·0	0	1
Kenneth F—	1·9	—0·2	0	2
George H—	2·6	—0·1	0	1 (2)
Dennis H—	3·4	—0·6	1	0
Peter H—	2·0	—0·1	0	1
Alfred I—	2·5	—0·6	1	0
John L—	1·8	0	0	1 (2)
Leonard M—	1·7	1·0	0	2
David N—	0·8	—0·1	1	0
Leslie S—	1·2	—0·2	0	0
William T—	1·8	0·1	1	0
Richard W—	1·7	—0·5	1	1
Albert B—	0·6	..	0	..
Jesse F—	1·5	..	1	..
William H—	0·6	..	0	..
Sidney S—	0·8	..	..	..
Averages	1·8	0·1	0·4	1

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Phase II: Improvement of Comprehension.

Plan of Experiment.

Previous tests on Burt's Graded Direction Test, the results of which had vastly differed from the investigator's own estimates derived from daily contacts with the children in the classroom, led to an analysis of Comprehension Tests. The term "Comprehension" may be defined as the ability to extract as much of the reading matter as has been put into it by the author. It is obvious that this does not depend entirely on a mere knowledge of the mechanical aspects of reading and the language used, but also on the quality of the mind co-ordinating the various processes involved. In short, it may be said that the upper limit of comprehension is set by an individual's intellectual capacity, and that, provided the necessary mechanical techniques are existent, a child's mental age as derived from a verbal intelligence test roughly indicates his "level of comprehension."

There exist, however, a number of adverse factors which may decrease a reader's "power of comprehension." A diagnostic analysis of the shortcomings revealed by Comprehension Tests led to the conviction that the main sources of failure were to be found in lacking attention to the exact meaning of the printed matter, in a limited knowledge of vocabulary with often most surprising gaps, and lastly often in a lack of speed. There were other influences as well, mainly on the affective level (8), which, however, could be dealt with only from the psychological angle and not merely from the academic side.

Inattention to the exact meaning implied in sentences and paragraphs was a source of frequent mistakes. Many comprehension tests pay particular value to the correct execution of instructions like underlining or crossing out of words, putting certain signs in certain places, etc. The children of our school had, like many other mentally defective children, a rather chequered life career behind them with an irregular school attendance, and neither the little instruction in the tool subjects nor the additional teaching received in other subjects had given them even the smallest inkling of the importance of accurate attention to detail. In that respect they were without a doubt severely handicapped in comparison with other children, and their shortcomings arising from that particular side were not accounted for by their lower intelligence.

A typical example of how the limited vocabulary of these boys affected the results of such a comprehension test like Burt's was offered by the boys of this particular class, none of whom had ever been able to score a Comprehension Age above nine. The item on Burt's scale for age ten which proved to be the stumbling-block for the whole class contains the little word "except." Lack of familiarity with this one word probably reduced many boys' Comprehension Age by at least one year.

The lack of adequate vocabulary, very often due to the long institutionalization of the children, interfered frequently with the understanding of test items. A fifteen-year-old boy with an I.Q. of 78 had spent all his life in institutions. Faced with the question, "Why is a tea-cosy put over a teapot?" with multiple choice for answer he chose, "It prevents the teapot from damaging a polished table." Having been brought up in institutions he had never had

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an opportunity of handling a tea-cosy, and actually thought it had a bottom. The same boy scored a test item with pictures of an onion, nut and peanut consistently wrong because he did not know, even at 16, what a peanut looked like, never having seen one in all his life.

Many Comprehension Tests impose a time limit, recognizing thereby the value of steady speed for the understanding of reading matter. All mentally defective boys I have tested so far, but for a few exceptions, score on a time-limited comprehension test considerably lower than when permitted to take their time. Slowness in reaction, however, is a typical aspect in the mental deficiency syndrome, and it was thought initially that nothing particular could be done about it, the best course being the avoidance of time-limited tests unless used for diagnostic purposes.

It was felt that it should not be impossible to train the children in learning to avoid certain sources of failure. Whether such training would indeed be able to raise the "level of comprehension" was largely a question of the exact meaning given to this term. However, such a training was sure to deepen the children's understanding, to bridge gaps, and to make them extract more out of their reading matter than before. This training would therefore certainly assist in increasing the "power of comprehension" even if the upper level of comprehension remained constant or, rather, moved with the mental age.

The exercises which were planned and which will be described in the next section represented in a way a sort of emergency training for institutionalized and delinquent children. The fact of their intellectual deficiency did not really enter the picture, as it was fully accounted for by using the concept of mental age and by working within this given frame. It was not a question of building up in height, but rather of extending in depth. This dimension needed attention, as the long institutionalization of many of the children and the irregular life of the delinquents had deprived them of the moulding and teaching processes of home and school. Much of what is picked up by the ordinary child in course of its daily life and which is with him a matter of course—see the example of the tea-cosy—is alien and strange to the institution and delinquent child. He is unaccustomed to attention to detail, concentration and the use of logical processes like analysis, synthesis, deduction, analogy, etc.

The Comprehension Exercises.

Emphasis was laid on the development of logical reasoning, which automatically included increased attention and concentration. The exercises with their attractive puzzle element were liked by all the children. The previous intensive drill with the resulting immense satisfaction in the achievements seemed to have taken the edge off the hard task of reading. (The experimenter made the observation that in phase III, described later on, newcomers to the class, who had not been through the training-period of the syllabication drill, were inclined to apostrophize exercises which they could not solve as "mental" and "daft"—a comment which had not been heard during the time of phase II.)

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Here a few examples:

"Draw a ring round a square."

"Draw a square in a ring."

"Draw a ring in a square if you are older than twelve. If not draw triangle with a ring round it."

"If the letter S occurs more often in the word MISSISSIPPI than the letter P, write the first letter of the second word in this sentence. If P occurs more often than S write the last word of this paragraph."

"Draw a square and divide it into four equal parts by using a horizontal and a vertical line. Write the answer to the question TWO TIMES TWO into the upper right-hand part. Into the bottom left-hand part write the number twenty if you are a girl and the number thirty if you are a boy. Then take away the number which you put in the upper right-hand part from the number in the bottom left-hand part and write the answer into the upper left-hand part."

These exercises, together with the usual exercises in analogy, opposites, deductions, secret codes, proverbs, absurdities, etc., were augmented by a certain amount of vocabulary drill. The meaning of everyday words was systematically taught, the usage explained, and the boys were encouraged to utilize their knowledge. Among these words could be found even such everyday words as frequent and gratis. At the same time the meaning of prefixes (in-, dis-, anti-, etc.) was explained and practised.

The work was done orally and for the whole class on the blackboard. Individual work consisted of cards with the same type of exercises and with a good number of prose pieces with the usual questions concerning content attached to it, which had to be answered in writing.

The group was identical with the group which had taken the syllabication drill, less five boys who had left when reaching the age of 16. These lessons were given daily during a period of three-and-a-half months (14 weeks) and took up (together with "private readings") one-third of the available school-time.

ACHIEVEMENTS.

Evaluation of the success of this part of the experiment proved to be difficult. This was mainly due to using Burt's Graded Direction Test, which in the experimenter's opinion is not really suitable for this type of investigation.

The weakness of this test, as far as the present purpose was concerned, was found to consist mainly in the facts, firstly that there is only one test item for the higher age levels, and secondly, that the test relies primarily, as the name indicates, on the "ability to carry out from a printed order some concrete practical instruction." This meant testing the very reading technique which, as will be discussed in the last part of this paper, was least of all developed in the boys. The Comprehension Age, indicated by the test, was, therefore, in the experimenter's opinion not to be taken as absolute, but showed rather the efficiency of comprehension of a certain type of reading matter. Bearing this in mind, the test itself was useful enough for indicating improvements, gains and losses, in the developing reading technique of the children.

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As mentioned, one particular difficulty encountered was due to the construction of the test with only one item per higher age level. It happened frequently that a boy was able to do the test item for one year, was unable to do that for the next year, but solved successfully that of the following year. The experimenter was unable to discover whether the missed year was to be taken into account in the final computation or not. In Table I, which gives the gains in comprehension of reading during the two phases, the figures in brackets indicate the gains if the missed year is reckoned as well, which seems to be quite defensible, as the test item of the year passed is, of course, more intricate than the missed one.

However, even when keeping on the conservative side and considering only the smaller gains, it is obvious that the group on the whole has made great progress during these three-and-a-half months' training. Of a group of 26 boys, there were 8 who added two years and 11 boys who added one year to their previous score. This means that 73 per cent. of the boys had gained by at least one year. Comparing this with the previous six months—the time of the syllabication drill—we find that only 33 per cent. of the boys had improved. In June, before the beginning of the training period, the Comprehension Ages on the Burt Test varied for the whole group between 6 and 9; after the training it indicated Comprehension Ages between 7 and 12. As the test measures only in years, the fact that seven boys did not show any progress cannot be taken as indication that they remained really stationary.

There is little doubt that these exercises taught the children to pay attention to the word and to be accurate, to concentrate on the meaning of what was actually said and not on what was "thought" to have been said, and to remember details, even if they appear at first to be superfluous. They learnt to grasp more accurately the interrelationship of words and to follow a train of thought. Thus their reading in general must have lost—it is to be hoped—much of the superficiality of the completely untutored reader who is left on the surface because he has never learnt or does not even know of the depth underneath. If the results of "Comprehension Tests" are indicative at all of a reader's power of understanding, then it must be assumed that this short training had provided these educationally subnormal boys with some additional techniques, which made them more efficient to respond on their mental level than they had been before.

Phase III: Improvement of Speed of Comprehension.

Plan of Experiment.

The outcome of the attempt of raising the level of comprehension was in many ways unsatisfactory. The shortcomings of the Burt test used in checking improvements made it desirable to repeat the experiment again, and to make sure by the use of more adequate tests that those vast improvements in comprehension, counting in years, could actually take place in a comparatively short time. Thus a third experiment was initiated after one year's intervals, which, though independent of the first two phases described, represents never-

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theless something in the nature of an appendix to the original investigation, particularly in view of the fact that some of the boys of the first investigation also took part in this additional experiment.

This third phase had the aim of increasing comprehension by increasing speed and accuracy.

The initial problem was the adoption of a suitable test of comprehension in reading. Burt's Graded Direction Test was felt to be unsatisfactory. Burt's Continuous Prose Test (2), "King of the Golden River," relied too much in the experimenter's opinion on memory, as did Ballard's Test, and was, considering the particular type of boy under consideration, therefore also unsatisfactory. There remained only Schonell's Tests R 3 and R 4 (3) (Silent Reading Test A and B), which were scientifically standardized and did not show the disadvantages of Burt's Tests. However, even these tests have their shortcomings when used with educationally subnormals. The R3 test, I knew by experience, was too easy for most of the class, and did, further on, not go beyond age 11. On the other hand, norms were given for unlimited time—an advantage, the lack of which in the R 4 test made this otherwise very good test not always truly indicative of a child's comprehension of reading. Most of the educationally subnormal children are extremely slow in reading, and imposing a time limit on them represents a considerable and unjustified handicap. However, Schonell's R 4 test being the only English test available after eliminating the others, it was decided to use it and to spend more attention on the question of increase of effective speed than hitherto. Since the experimenter felt that the time limit would lower the boys' final score, the need for an additional test of comprehension cropped up, a test which did not contain such handicap. Thus Gates' (4) Level of Comprehension Test contained in his Reading Survey (5) was included in the test-programme, and its results were assumed to indicate approximately the effective level of a child's comprehension of reading, since the child was still handicapped by ignorance of vocabulary. Previous experimenting with this test had convinced the investigator that the few Americanisms in this test did not appreciably interfere with the results, and that it was well worth while using this test as long as no better instrument was available. In order to gain an idea of the qualitative working of a reader's technique of comprehension Gates' Diagnostic Tests A, B, C, D (6) were also added. They will be described in another section, together with the results achieved.

The battery of Reading Comprehension Tests used for measuring achievements consisted therefore of—

1. Schonell's Silent Reading Test A (R 3) for ages seven to eleven plus, with unlimited time. (Only used for the poor readers.)
2. Schonell's Silent Reading Test B (R 4) for ages 9 to 13 plus, with a time limit of 15 minutes.
3. Gates' Level of Comprehension Test contained in his Reading Survey, for ages 7.10 to 17.8 with unlimited time.
4. Gates' Diagnostic Reading Tests A, B, C, D with time limits of 8 resp. 10 minutes.

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It was felt that the use of such an extensive reading battery with its possibilities of cross-checking would make it clear beyond doubt whether a child had actually within a very short time improved on his reading comprehension.

THE EXERCISES.

On the whole this experiment was based on the same principles as those described for phase II. The main difference was that the entire emphasis was put on individual written work, whilst oral blackboard work in "Logic" was entirely cut out. The "Comprehension Cards" took the same form as in the first experiment, though, of course, a greater number with a better grading was provided. Besides this, cards with exercises on the "missing word" principle were introduced, and the older boys received a great number of "dictionary cards" containing sentences with, for them, difficult vocabulary. Their task was to translate these sentences into their own "Basic English" with the help of dictionaries or the knowledge they had acquired.

An incentive was provided by giving the whole experiment the form of a competition with points to win and a weekly grading according to the number of points won. This spurred not only everyone to give his best, but provided incidentally a stimulus for the acceleration of effective speed in reading. But for this feature of the competition no other consideration was given to "increase of speed," nor was the children's attention drawn to it.

During a period of three months each child worked one lesson each day on his "comprehension cards," and had thus done 56 lessons at the end of the experimental period. "Dictionary-words lessons" were about one or two a week. Considering that there were, moreover, two periods a week devoted to "silent private reading," we may say that nearly half of the available time in school was given to reading in one or the other form.

The Experimental Group consisted of 20 boys, 11 of whom had taken part in all the previous work, whilst the remaining 9 were newcomers to the class. Therefore, results of earlier tests could be given in the following tables only in the cases of the 11 boys.

ACHIEVEMENTS.

The figures of Table II show that good improvements are possible as a consequence of an intensified training. The improvements in Comprehension, however, are not as staggering as were the improvements in the previous experiment of phase II, measured on the Burt Test. But it must not be forgotten that the Gates Test measures in terms of years and months, the Burt Test only in years. Thus the Gates Test is a much finer instrument, recording improvements more adequately than the Burt Test with its astounding leaps from year to year. It will be observed that one of the three boys in the Table, who were given the Schonell R 3 test, showed an immense achievement. The R 3 test also measures only in terms of years.

The last two columns of the Table show the results of Schonell's R 4 test, and the figures of gain here show the boys often to more advantage than on the Gates Test. On the surface, the results of this test suggest a far greater

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TABLE II.—*Showing the "Comprehension Ages" and Gains After a Training Period of Three Months (February–April, 1948).*

	Mental age.	No Time Limit. "Comprehension Age," Gates. Age.	Gain.	Time Limit. "Comprehension Age," Schonell R 4. Age.	Gain.
Kenneth V—	11·6	13·1	0·10	11·3	0·6
Alfred P—	12·5	12·11	0·9	13·3	1·0
George P—	13·8	12·5	3·2	11·0	1·9
Jack W—	11·4	13·7	0·11	13·3	0
Edwin O—	9·6	12·5	1·1	12·3	0·9
Leslie B—	11·6	12·2	0·3	13·0	0·6
Ronald W—	12·4	12·2	0	11·3	0·6
Joe P—	11.5	11·4	2·0	9·9	2·3
Cecil A—	10·7	12·3	2·11	9·6	1·6
Leslie A—	11·9	12·11	0·3	11·3	1·0
Joe K—	11·9	12·8	0·5	13·9	2·0
Gordon T—	11·6	10·8	1·4	11·3	1·6
Ronald St—	10·9	10·3	0·10	9·9	0·6
William T—	9·4	10·3	0·10	10·0	1·6
William W—	9·4	11·0	0·4	8·9	0·6
Fred K—	9·8	11·1	0	11·9	0·6
George S—	9·0	9·9	0·6	10·3	2·9
		Schonell R 3.			
Brian T—	8·11	10·0	1·0	..	..
Ronald Sh—	8·8	10·0	3·0	..	..
George T—	9·1	7·0	7·0	..	..
Averages	..	..	2 years	..	1·1 years

improvement in Comprehension of Reading than had been indicated by the other test. One has, however, to bear in mind that this test sets a time limit of 15 minutes, and that, therefore, the higher figures may be wholly or partly due to increased speed. Only if one is prepared to conceive speed of perception and analysis as an integral part of that entity we call vaguely "Comprehension of Reading Matter," are we entitled to take the higher figures of Schonell's Test as the more satisfactory indices of improvement.

The last but one column, which shows the actual results of Schonell's R 4 test is extremely interesting when compared with the results on the Gates Test. Many boys show a less high "Comprehension Age" on the Schonell than on the Gates Test. This is, no doubt, due to their lack of speed, which was seemingly not yet sufficient despite the good gains during training. Other boys' score when reading under the speed limit is higher than on the Gates. This is mainly due to the fact that the Gates test involves understanding for an increasingly complex vocabulary, whilst the Schonell Test uses items of a

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more or less uniform level of vocabulary though increasing the complexity of the logical task involved.

The comparison of the differing results of the two tests underlines the need for an accurate study of the construction of a comprehension test before the test's onesidedness is translated into terms of a child's deficiency in general comprehension.

The Techniques of Comprehension.

Though the results of the various comprehension tests used showed on the average a good overall increase in the efficiency of reading, the individual work with the "Comprehension Cards" in the classroom showed the existence of great differences in tackling various reading situations by the individual boys. One boy proved to be better and quicker in grasping the whole meaning of a paragraph than another, who on the other hand was perhaps better in perceiving and retaining details, and was generally more accurate than the first fast reader.

It has been maintained rightly (4) that comprehension of reading matter necessitates the mastery of various reading skills, and the battery of A. I. Gates (6) has been designed to measure four sharply differentiated reading techniques which, according to the author, have all to be brought into play for meaningful reading. It is, however, quite possible that one or the other technique is poorly developed, with consequent shortcomings in that particular aspect of comprehension.

Gates designed the following four tests to measure the efficiency of reading techniques:

> "Type A—Reading to Appreciate General Significance—is designed to measure an individual's skill in reading merely to get an accurate general impression from the passage.
>
> "Type B—Reading to Predict the Outcome of Given Events—requires, like Type A, a grasp of the general significance of the passage, but it also requires a special type of analysis of the facts given in order to predict which of several possible events will be most likely to happen next.
>
> "Type C—Reading to Understand Precise Directions—was selected to measure rigid, careful, exacting reading.
>
> "Type D—Reading to Note Details—requires recognition and analysis of many details in a passage, but it demands a less definitely organized or integrated grasp and recall of the elements of the paragraphs."

Whilst the present experimenter does not entirely agree with the selection and significance of these four different techniques, it was felt that it would be interesting to record the changes and improvements of the various boys' reading skills in the course of the experiment. A method like that of the "Comprehension Cards," with its insistence on the development of accurate attention to detail, of interpretation and of logical reasoning, must, it seems, inevitably influence the results of these four different tests.

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The boys of the Experimental Group were tested on this battery on three different occasions. The first time (Nov., 1946) fell at the end of Phase I of the investigation, and coincided in time with the Burt Test given after conclusion of this phase. The results of this test are, therefore, already influenced by the foregoing three-and-a-half months' exercises.

The second and third time the battery A B C D was administered at the beginning and the end of Phase III, and results are expected to have been highly influenced by the three months' intensive training.

The Gates Battery measures firstly speed of reading easy material for the four different purposes indicated above, and the individual achievements are indicated by age levels. Secondly, it measures accuracy of comprehension, indicating how much of the reading material attempted was correctly interpreted. The score is a percentage figure, 100 per cent. indicating that all the material read has been correctly responded to. Thus the Gates Battery, though not attempting to measure the level of a child's comprehension, furnishes important data concerning the efficiency of reading, selecting with great ease the fast but inaccurate readers, the slow and accurate readers, the readers deficient in one or the other reading technique, etc. Thus these four tests provide at least a partial answer, not to the usual question, "How well does he read?" but to the often just as important question, "How does he read?"

No particular effort was made during any period of the investigation to utilize the diagnostic results of this battery by giving, for example, particular specialized reading material to a child with a diagnosed particular deficiency. Rather it was the intention to observe whether deficiencies in the four techniques would automatically be eliminated or at least made less obvious as a consequence of the "Comprehension Card" method applied indiscriminately to the whole class.

TABLE III.— *Showing the Gains in Accuracy of Comprehension (Percentage Figures) between November, 1946, and April, 1948, in the Four Techniques of Reading: A, Appreciating the general significance of a paragraph; B, Predicting the outcome of given events; C, Following precise instructions; D, Noting of details.* (*A. I. Gates.*)

	A.			B.			C.			D.		
	Nov.	April.	Gain.	Nov.	April.	Gain.	Nov.	April.	Gain.	Nov.	April.	Gain.
Kenneth V—	72	100	28	84	83	−1	73	100	27	86	97	11
Alfred P—	73	92	19	71	86	15	78	82	4	85	92	7
George P—	87	92	5	77	100	23	40	100	60	76	100	24
Jack W—	75	90	15	85	87	2	45	95	50	97	100	3
Edwin O—	72	81	9	68	83	15	63	81	18	82	100	18
Leslie B—	87	86	−1	73	75	2	60	73	13	81	83	2
Ronald W—	72	76	4	85	65	−20	18	90	72	68	80	12
Joe P—	84	75	−9	67	90	23	25	78	53	44	92	48
Cecil A—	50	87	37	28	90	62	75	75	0	100	85	−15
Leslie A—	100	87	−13	62	100	38	59	73	14	95	100	5
Joe K—	100	78	−22	77	81	4	82	81	−1	88	86	−2
Averages	79	85	6	70	85	15	56	84	28	82	92	10

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As "Comprehension Cards" were used in the class since the beginning of the second experiment (Sept., 1946) up to the end of the investigation (April, 1946), though with special emphasis during the last three months (Phase III), it is more instructive to compare—at least as far as the acquisition of accuracy is concerned—the results of the Nov. test with those of April. Table III demonstrates, therefore, the influence of these Comprehension Exercises on the accuracy of reading and interpreting for the eleven boys who had been available at both tests.

The great inaccuracy in reading, particularly in the reading of Type B and C in Nov., 1946, is quite obvious, yet at that time the children had already received a certain amount of training in course of the work for Phase II, which had raised their power of comprehension considerably and presumably to a certain degree their accuracy.* In course of the further training during 1947 and the first part of 1948 the children received sufficient training to raise their scores considerably in those techniques which were poorly developed. A few, it is true, have dropped a little, probably on account of a certain "examination fever," but the general picture of improvement of accuracy on all fronts remains unaffected, as shown by the averages for all four tests, which are all well above 80 and close together.

Discussion of the Results.

Considering the results of the initial November test, 1946, it is very clear that the children did generally far better in the two tests A and D than in B and C. Test A measures the understanding for the general meaning of a paragraph, Test D gauges the understanding for relevant details. In both tests the boys achieved an average percentage score of about 80 per cent. It is not further surprising that these children should do best in these two tests because the techniques measured are the most relevant for any purposeful reading. It is obvious that a child, once having mastered the technique of fairly fluent reading and beginning to read for enjoyment's sake, will have to develop that technique of reading which enables him to understand "what it is all about." Many details may remain incomprehensible and are "skipped," yet the child is able to follow the trend of the narrative. Thus the possession of this one technique secures at least a certain minimum of satisfaction.

Details are very likely to escape many readers, and this inattention to relevant items is one of the causes for "non-comprehension" in the narrower sense of the word. The child has grasped that something has happened, therefore good score on a test appreciating the general significance of a paragraph. We cannot be so sure that he knows why and how something has happened because the understanding of interrelations depends not merely on the intellectual grasp, but also on having registered and stored away in the memory various items of information. It is true that the test results of Test D do not show this alleged inattention to details, but this is due, in the experimenter's opinion, to the shortcomings of the test itself. As the test

* Unfortunately the test could not be given at the beginning of Phase II as the necessary forms had not arrived in this country in time.

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permits re-reading of the test items most children make use of this opportunity, and obtain thus higher scores than would be warranted by their efficiency in the actual reading situation.

Test C, which gauges careful and rigid reading with attention to detail, shows on the whole very low efficiency, and its results support our thesis of general inaccuracy.

TABLE IV.—*Showing the Gains in Speed and Accuracy of Comprehension during a Training Period of Three Months (February–April, 1948).*

	Speed in years and months.				Accuracy in percentages.			
	A.	B.	C.	D.	A.	B.	C.	D.
Kenneth V—	·5	·5	1·10	— ·1	0	—10	5	0
Alfred P—	·11	1·3	1·9	1·0	—2	3	13	7
George P—	·6	·8	1·8	1·0	2	15	28	10
Jack W—	0·9	2·3	2·7	1·5	1	16	0	7
Edwin O—	0	1·0	1·7	—0·3	—8	8	3	11
Leslie B—	1·7	1·3	2·10	2·7	0	—4	14	—7
Ronald W—	0·4	0·4	3·3	0·2	—9	—10	—5	—3
Joe P—	0·1	0·6	1·3	0·9	4	6	15	5
Cecil A—	0·4	0·6	1·1	0·9	27	19	39	—15
Leslie A—	0·4	1·4	1·9	0·2	—6	10	—5	0
Joe K—	0·8	0·3	3·0	0·6	—7	—13	10	0
Gordon T—	0	0·10	3·1	0·7	0	22	39	8
Ronald S—	0·5	0·3	3·7	1·0	—6	—6	40	2
William T—	0·2	0·1	—0·11	0·1	—5	2	—40	—11
William W—	0·1	0·3	0·6	0·8	4	9	—6	0
Fred K—	3·7	2·0	3·3	2·9	18	—7	21	13
George S—	0·7	0·6	2·2	0·5	23	24	15	—7
Averages	0·7	0·9	2·0	0·9	2	5	11	1

The results of Test B, "Reading to Predict the Outcome of Given Events," are also low. This test is obviously in its very construction on a much higher level than the other three. It not only requires attention to the factual content and a grasp of the events given, but also asks for an analysis of the implications—in fact for the logical conclusion of a train of thought. It is perhaps quite reasonable to assume that this particular technique will be poorly developed in the educationally subnormal, yet the subsequent results show that this technique also is trainable.

Studying the figures of Table IV, which show the gains during the training period of Phase III, demonstrates exactly the same tendencies which came out so clearly in Table III, though the gains during three months are, of course, less than those made during more than one year.

Considering the figures of speed first, it is obvious at once that far less

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gains are made on the average in the reading of types A and D than in types B and C. The conclusion is that on the average the boys were already doing fairly well at the beginning of the three months' period, and not much could be added in these two techniques, which came easiest to them anyway. Different is the picture in B and C. Here the efficiency had suffered severely through inaccuracy and unfamiliarity with logical thinking, as had been made clear by Table III. Therefore here was ample room for improvement, and the boys took their opportunity, as witnessed by the almost staggering gains during the short training period.

The percentage figures of accuracy show on the whole the same picture as Table III. A and D improve far less than B and C, because the first two techniques have already been fairly well mastered. Interesting are the many slight drops in the accuracy percentage figures, which show that the corresponding gains in speed have weakened the accuracy in reading—a hint that further remedial training will be needed.

The conclusions after studying the figures of the two tables are simple. The only reading technique which was fairly well developed throughout the class and showed, therefore, least improvement, was that technique without which reading for enjoyment is simply impossible. The other two techniques, B and C—D is not considered in this connection for reasons mentioned above—depending to a large extent on attention to detail and on an analysis of the factual contents, were in nearly all cases undeveloped owing to the fact that they were not primarily necessary for " Reading for Enjoyment." This situation, it may be assumed, is the typical outcome of untutored reading.

" Reading for Knowledge," which would have automatically developed these techniques, was nearly unknown to this class of educationally subnormal boys. They had received very little training in that type of 3R work, and that little only on an elementary stage, as the preliminary acquisition of the mechanics of reading took up most of the time. They had had very little practice indeed of attending to the details of printed matter, of paying due regard to words and of weighing each word for its exact meaning. They had very little idea how much depended on the correct grasping of one particular item and how inaccurate and hasty perception and analysis of words made their whole reading meaningless and valueless. In that respect, we may assume, an ordinary child, being educated in an ordinary school, has far more training, since all his academic work can only satisfactorily be solved by often meticulous attention to the exact meaning of words. Vagueness of ideas and neglect of attention to relevant details, whether in reading or other subjects, will certainly soon be discovered and be remedied.

Training for " Reading for Knowledge " by means of the " Comprehension-Card Method," with its insistence on analytical and synthetic processes, proved its value by assisting to make up in a short time for great arrears of work. It not only increased the power of comprehension, but furthered also perceptibly the standard of accurate interpretation of reading material. This proved, moreover, that the diagnosed shortcomings in the reading techniques were indeed the outcome of the previous untutored reading, and by no means typical for the educationally subnormal boy.

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Summary and Conclusions.

Summing up the results of the work described in the foregoing pages the following points may be made:

1. Scientifically designed educational programmes in a senior class of educationally subnormal boys with I.Q.s' between 92 and 55 aimed at the rapid increase of various aspects of efficient reading.

2. To improve fluency and accuracy of word perception a "syllabication drill" was devised, which combined elements of the phonic and sight reading method, and which was considered to be most efficient with this particular type of boys on account of its psychological implications.

3. As a result of six months' intensive training the level of mechanical reading was raised throughout the class well above expectancy. The gains were up to three years and four months, with an average of one year and eight months for the whole class.

4. To improve the power of comprehension of reading matter "Comprehension Exercises" were devised. These involved group and individual training in logical thinking, attention to detail and extension of vocabulary.

5. As a result of three-and-a-half months' training the test scores in "Comprehension of Silent Reading" were raised appreciably; 73 per cent. of the group improving by at least one year, many by two years.

6. To improve speed and efficiency of comprehension of reading the "Comprehension Card" method was intensified and the progress of the experimental group checked by a battery of tests.

7. As a result of three months' training a perceptible increase of the speed of comprehension throughout the group was noticeable. In the various techniques of reading comprehension the average gains of the experimental group showed to be: 0–7, 0–9, 2–0, 0–9 months in speed of comprehension. Gains in accuracy of interpretation were slight, having apparently suffered by the increase in speed.

8. The increases of the test scores in "Comprehension of Reading" were very pronounced as in the previous experiment. On the time limited test the average gain of the group tested was about one year, with a maximum gain of two years and nine months. On the tests without time limit the group achieved an average gain of two years with a maximum of three years.

9. It has been suggested that the work which increased the results of comprehension tests so considerably did not really raise the "Level of Comprehension," which by definition is roughly equal with verbal intelligence once the necessary technical equipment (fluency and accuracy of word perception—vocabulary) has been mastered. The term "Power of Comprehension" appears to be more adequate, as it suggests the "depth" of understanding rather than the "height" of understanding. It has been thought that the educational programme described has assisted largely in this direction by developing and utilizing reading techniques, which had never been brought into play owing to various adverse environmental factors.

10. A discussion of the significance of the methods used in relation to the academic purpose aimed at and the psychological implications involved has

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attempted to point out the impossibility of isolating "Improvement of Reading" as a purely academic problem.

11. Generally speaking the results of the investigation described in the preceding pages indicate that it is well possible to raise the efficiency of the reading of educationally subnormal boys in all aspects within a comparatively short time. But even more important than these scholastic gains for the heightened efficiency in post-school situations are the effects on the psychological make-up of the children, who will gain heightened self-confidence, a decrease of inferiority feelings and an increased feeling of security by the unexpected and, for them, overwhelming rapid success in their weakest subject.

In concluding this paper one cannot avoid pointing out the extreme vagueness of the term "Comprehension." The disunity as to the exact meaning of comprehension becomes apparent in the different constructions of comprehension tests. Interpretation of meaning, execution of orders, insertion of missing words, selecting items of information following a train of thought are among the different principles used, involving very often the additional factors of speed and memory. The Gates battery of diagnostic tests shows conclusively how uneven may be the development of these different aspects of reading for comprehension, and that we may misjudge seriously a child's understanding if testing only one or the other aspect of his reading achievements.

This knowledge of the various techniques of reading comprehension is indeed one of the most valuable pieces of information we have to plan a child's training and to judge his deficiencies and improvements. Far too much stress has been laid on the problem of the teaching of the mechanics of reading. This is, of course, the bottleneck in 3R work and has to be eliminated. But the result of this insistence on the "barking at print" side of the problem led often to neglecting the problem of comprehension, because it was more or less tacitly assumed that comprehension would, so to speak, take care of itself as soon as the mechanics were well established. The literature of the problem of teaching word perception is legion, that on comprehension of reading is negligible.

Reading for comprehension involves a number of psychological processes like perception, analysis, synthesis, deduction, organization, etc. All of these processes need training, a training which is furnished for the ordinary child by the influence of his environment, namely home, school, friends, etc. The quality and level of achievement reached in these processes are determined by intelligence. If it, however, happens that the training is unsatisfactory because of various adverse circumstances, the intellectual processes will in consequence also be unsatisfactorily developed—will become patchy and uneven.

Many causes may be responsible for this result. Lack of life experience, as, for example, in institutionalized children, may be just as important as lack of verbal background due to impoverished cultural surroundings. Emotional maladjustment may play just as big a part as an ingrown habit of carelessness

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and inattentiveness. Each of these factors may cause one or the other shortcoming in the techniques of comprehension. Lack of experience will deprive the child of the possibility of establishing important associations between his reading-matter and what he knows; lack of verbal background excludes him from understanding reading matter written in adult vocabulary; emotional maladjustment will not only influence his whole attitude towards reading, but will very often be causative for constant misunderstandings and misrepresentations of the reading matter; whilst lastly, carelessness and inattentiveness are at the bottom of many reading failures, because these unsuccessful readers have never learnt to pay sufficient attention to matters of detail.

As these shortcomings are, therefore, mostly due to lack of suitable training and not so much to shortcomings in intelligence, the whole problem turns to the findings of ways and means whereby to overcome these deficiencies and weaknesses.

The present paper has attempted to show one possible way. The experimenter would like to state that he himself is not entirely satisfied with the methods used. The syllabication method is perhaps limited to certain age groups only, and is very demanding in time and energy. It is possible that its good results are largely favoured by the particularly encouraging atmosphere in the institution, and may, therefore, not easily be repeatable in other circumstances. Still it appears, especially on account of its psychological implications, full of possibilities. As for the "Comprehension Card" method, it is not only easily fitted into the syllabus, but capable of various kinds of development giving continuous intellectual stimulation to the individual. It seems to be a very easy, happy and successful way for eliminating the awkward gap between mental capacity, as shown by an intelligence test, and power of comprehension, indicated by a suitable test of comprehension in reading.

As an afterthought, a possible objection to the great stress put on reading may be encountered in advance. It has been stated that one-quarter to one-half of the school time was occupied with reading in one or the other form. It may be argued that for a special school the amount of time spent on the academic subject of reading for the future hewers of wood and drawers of water is impracticable. It reduces seriously the time available for the training in manual subjects, which will, after all, be primarily needed by these boys in after-school life. To this the reply must be made that first of all reading is nowadays such a key subject that one is justifiable in spending a great deal of time over it even in the case of mentally defective children. Secondly, it must be recalled to mind that many of the children in these schools are without a doubt intellectual borderline and psychological problem cases. It is too often forgotten that even children with low intellectual capacity have their personality problems. Reading was in many cases most probably the subject where these children experienced the first discouraging feeling of failure and defeat. It seems important that the child should be enabled to experience the feeling of achievement and success just on the very field which saw his first tremendous scholastic failure. The psychotherapeutic effect of such experience may be of considerable value in his attempts of reconstructing his life, which had undergone such serious shocks at the beginning.

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ACKNOWLEDGMENT.

I wish to thank Dr. C. J. C. Earl, the Medical Superintendent of Monyhull Colony, Birmingham, for the great assistance he has given me during the whole of the investgation, but particularly for his many stimulating and invaluable talks, which have helped me considerably in seeing in the mentally defective child the emotional problems rather than the intellectual shortcomings.

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LEUCOTOMY IN THE TREATMENT OF PSYCHOPATHIC FEEBLE-MINDED PATIENTS IN A STATE MENTAL DEFICIENCY INSTITUTION.*

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THE results of leucotomy in mental hospital practice are already well known and are familiar from the Board of Control's review of 1,000 cases published in 1947.

I am not aware that in mental deficiency institutions the operation has become a practice in application to cases presenting gross abnormality of conduct having its origin in mental disorder which, though not amounting to one of the insanities, has the characteristics of a psychopathic state.

At Rampton we have, as you know, a select population of some 1,200 defectives recruited from the ordinary certified Institutions and Colonies of England and Wales, where their extreme behaviour can no longer be tolerated, as well as those sent to us through the Courts.

A very large proportion of them are young and of feeble-minded grade, quite distinguishable to my mind, from the ordinary run of defectives in mental deficiency institutions, by qualities and characteristics not only of intelligence but also by the exhibition of almost all the text-book manifestations of the psychopathic state.

I am not proposing to define those qualities of mind which in my opinion differentiates them as a class and although they *are* distinctly more intelligent there appears to be one characteristic defect—lack of judgment and foresight—common to all of them as a group. On the emotional side, especially among the females, there is marked instability.

Two definitions of the psychopath or psychopathic personality by Henderson and by Cheyney cover the chief characteristics of our patients. These definitions and many others are to be found in Curran and Mallinson's review of the subject in the "Recent Progress in Psychiatry" number of the *Journal of Mental Science*, 1944.

Henderson, preferring the term "Psychopathic State," says "it does not imply total mental unsoundness, defect or delinquency, but yet allows for modifications of all of them—sometimes approaching the realm of defect, but yet not amounting to it—it is the name we apply to those individuals who throughout their lives or from comparatively early age have exhibited disorders of conduct of an antisocial or asocial nature, usually of a recurrent episodic type, which in many instances have proved difficult to influence by methods of social, penal and medical care and treatment," etc.

Cheyney defines psychopathic personalities as characterized by emotional immaturity or childishness with marked defects of judgment and without evidence of learning by experience. They are prone to impulsive reactions

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without consideration for others and to emotional instability with rapid swings from elation to depression, often apparently for trivial causes. Special features in individual psychopaths are prominent criminal traits, moral deficiency, sexual perversion, etc. Intelligence as shown by standard intelligence tests may be normal—or, on the other hand, not infrequently a borderline intelligence may be present.

You will note their reference to the intelligence level. Our own conviction is that psychopathic deviations of any degree or variety can be accompanied by intelligence levels below border-line and our case-histories will, I think, prove that contention. Further, you will note the statements that they benefit neither from experience, nor from medical care and treatment.

With these definitions in mind then and without unnecessary reservations as to the question of intelligence or mental age level we will be forgiven, I hope, for the rather lengthy title of this paper. This title seemed preferable to the alternatives originally suggested, e.g., "Results of Leucotomy in the Criminal Mental Defective," a title which suggested that we had set out to treat criminality by cerebral operation. Nor was the title "Leucotomy in the Treatment of Defectives of Violent and Dangerous Propensities" quite appropriate since it is doubtful if the psychopathic element in the selected cases would be appreciated as the principal feature (as we venture to suggest) rather than a conception of violent behaviour as a mere concomitant of the mental defect.

In the matter of behaviour then we were quite satisfied that the cases selected, clinically, merited the term psychopathic and for the purpose of selection for operation we had special regard to prominent characteristics such as severe emotional tension with considerable repression of the urge to do something dramatic or of violent nature, almost invariably ending in overt expression by injury to the person so that blood had to be shed, or by damage to property and sometimes violence to other persons.

A few exhibited manic-depressive phases, transient though sometimes more persistent, with suicidal ideas and others, again, dangerous impulsiveness with or without a paranoid attitude.

Time will not permit of a description of more than a few cases, but I think that these in detail will be of interest and will give a better clinical picture than mere tabulation of prominent characteristics, and you will note how they conform to the definitions of psychopathy quoted at the beginning.

All our cases were operated on by an experienced neuro-surgeon, Mr. Hardman, of Sheffield, and it is noteworthy that they were done under local anaesthesia with premedication by Omnopon ⅓ gr. and Hyoscine Hydrobromide 1/150 gr. except for two cases to whom Pentothal had to be given owing to anxiety and restlessness.

We have, to date, operated on 20 cases, 14 women and 6 men. Having reached this number we decided to call a halt in order to review the results achieved and to determine, if possible, what types responded best to the operation, or conversely if the operation was valueless in any particular case.

In the series of 20 cases, 2 were epileptics, 5 were post-encephalitics, and 13 were uncomplicated by demonstrable organic condition. We shall call the

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first two combined the "organic class" and the last the "uncomplicated." It will be useful to deal with each sex separately.

Females.—Group A.

	Six months or more.	Markedly improved or recovered.	Improved.	Little or no change.
Epileptics	2	–	1	1
Post-encephalitics	3	–	2	1
Uncomplicated	9	6	2	1 (worse)
	14	6	5	3

Males.—Group B.

Epileptics	*Nil*	–	–	–
Post-encephalitics	2 (E.H.)	–	1	1 (E.H.)
Uncomplicated	3	1 (A.V.T.)	1	1
Died	1	–	–	–
	6	1	2	2

Grand total = 20.

Taking first the women. In Group A we consider as recovered or remarkably improved 6, i.e. 43%; improved in certain aspects 5, i.e. 36%, and as failures or not improved 3, i.e. 21%.

As for the men (Group B), three can be regarded as improved and two are failures; and one died.

It will be noted that it is in the uncomplicated class that we get those cases that can be regarded, up to the present, as showing "recovery" or remarkable improvement.

I think it will be instructive first to devote our attention to those in this uncomplicated class primarily, to give an example from each of the other classes and to consider also the failures.

E. S—, female, born 1918, admitted 30 November, 1937, aged 19.

Previous history, family and early.—When she was only ten months old her father died. Her mother was in receipt of poor relief for some years following, and gave birth to an illegitimate child early in 1920.

The mother remarried, but her four children were cared for in Public Assistance Institutions, E. S— being removed from her mother in July, 1920. She attended an elementary school from age 5–14, and reached standard five before she left.

On leaving school, she attended a Home for friendless girls, and later was sent to a Training Home, but had to be returned to the P.A.I. owing to uncontrollable outbursts of temper.

Summary of conduct from date of certification, 25.i.37, to admission to Rampton, 30.xi.37.—She had furious outbursts of temper with no provocation and attacked staff and other patients. She was described as "terribly violent" and prone to scream and howl like an animal. She attempted to put hot irons on other girls in the laundry. At this time, E. was persistently maintaining that she was pregnant, although in fact she was not. It is recorded that the idea of pregnancy was probably associated with an impression made on her mind when at the age of 2½ years, she witnessed the birth of her mother's illegitimate child when no responsible person was present.

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Mental state on admission.—A feeble-minded person. She was hostile, uncooperative, and refused to take her food. She was described as childish in conversation and demeanour, unable to do simple performance tests, and ignorant of facts of common knowledge.

Conduct and progress at Rampton.—1937–1943: During these years her conduct was difficult in the extreme. She very frequently smashed windows and lacerated her arms with glass. She was noisy and obscene, and involved in fights with patients and struggles with staff. In 1939 she climbed on to the kitchen roof in company with another patient and did heavy damage. Again in 1941 she and another patient climbed on to the roof of our Refractory or Isolation Ward. There she remained for over six hours, demolishing glass, slates and coping stones. During this period she was in a state of great excitement, yelling obscenities and oaths while she proceeded with her work of destruction.

She rarely survived a month without some demonstration of violent or unruly conduct and exhibited phases of depression alternating with elation. In 1942 she succeeded in obtaining by stealth, a bottle containing chloral, and drank a quantity with intent to commit suicide. She was all this time a clean and tidy girl and a good domestic worker in her quieter moments.

1944–1946: These years showed little improvement in her conduct. She appeared to be frequently under great emotional strain and to be able to ease this strain only by violence or by mutilating herself with glass. She made several attempts at suicide by tying up her neck.

She appeared to suffer considerably from her emotional state and to be keen to release herself from the burden of the tension and the violent action which appeared necessary to give relief. As none of the usual methods of treatment or management appeared to be of any benefit, it was decided that she was a most suitable case for our first venture in prefrontal leucotomy. This was performed at Rampton on 24.i.47 under local anaesthesia by Mr. J. Hardman.

Post-operative progress.—She made an uninterrupted recovery from her operation, and though slow in cerebration and movement while in the hospital, was co-operative and generally of cheerful disposition. Greediness and meanness for a time were very noticeable—a contrast to previous characteristics. She stated two months after the operation that she had not the slightest inclination to cut her arms or injure herself or anyone else. Emotional tension had disappeared and she has displayed no violent or dangerous conduct. She had occasional sullen and moody days and became piqued if she received less attention than she considered her due. She gave her attention to domestic work, doing this in a clean and industrious manner.

Present mental assessment.—A feeble-minded person whose mental age has recently been assessed at 7 years and 8 months, though before operation this was assessed at 8 years 4 months. Intellectually, therefore, she appears to have regressed slightly.

Her memory for details recent and remote is good. She is fond of reading detective stories and remembers the plot. She sleeps well and has no desire or need for sedatives—a contrast to her state before operation. States that she never has headaches now, does not experience moods of tension ("being all worked up") and is free from depression and anxiety.

Physically.—Well.

Discharged some weeks ago, to her house in a small hamlet, she settled down without any difficulty, and when I visited recently reports were excellent. She took to cycling at once, visiting married brothers and sisters, going to the village shop and making purchases with accuracy, and joining in the housework with zeal and efficiency.

She loves children and exhibits normal affection for her relatives and writes to us regularly appreciative if somewhat illiterate letters.

B. S. G—, female, born 2 October, 1914, admitted 25 February, 1933, aged 18½ years.

Previous history. Family.—Patient is the youngest of a family of nine children. She lived with her father, step-mother, half-brother and half-sister. Patient's step-mother was unable to control her.

Early history.—She made good progress at school, but was, however, inclined to associate with younger children.

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Summary of conduct prior to admission.—On leaving school she ran away from situations and attempted suicide on two occasions by taking lysol. She was admitted to a Training Home for six months, where she was found to be indolent and lazy, stubborn and a dirty type of girl. She used to abscond and stay out all night with men, but did not appear to realize the seriousness of her actions. Admitted to a Public Assistance Institution she was there regarded as suspicious and stubborn, and frequently talked about committing suicide. She sulked when reproved and became destructive, but could not account for her actions. She developed a cruel streak and ill-treated aged patients by jumping on them. Her temper was hasty and violent, and she struck both nurses and patients. Her personal habits were filthy and she would not wash herself unless forced to do so. She liked to be in the limelight and was content to be blamed or praised.

The patient was admitted to a Mental Colony where her conduct rapidly deteriorated. She became a great danger to other patients and staff, and threatened older infirm patients with a lighted paper, and attempted to set the building alight; she smashed windows, tore plaster and bricks from the wall of her side-room, then smashed the woodwork with the bricks. She caused self-injury with broken glass or any sharp implement available. She used most obscene and offensive language to annoy the staff, and was the ringleader in any subversive plots.

Mental state on admission.—Patient was found to be a feeble-minded person. She failed at simple arithmetical problems and performance tests. She was noisy and excitable during interrogation, and spoke freely about wanting to smash windows.

Conduct and progress at Rampton up to 23.vi.47, *when leucotomy was performed.*—1. Following admission in February, 1933, her conduct was extremely bad, and there was a repetition of all the misconduct and extreme behaviour exhibited before her admission. She dismantled her bedstead and smashed the windows of the doors with it.

2. Her attitude during her very brief intervals of calm was childish and fatuous.

3. Those quiet periods ended suddenly and dramatically with an outburst of violence by smashing, screaming and obscene language. She made frequent attempts at suicide and lacerated her arms with enamel from her chamber or broken glass from the nearest window. She inserted needles into her body, bit pieces of flesh out of her arms, ligatured her legs in an attempt to constrict the circulation, and smeared her body with faeces.

Finally, in August, 1946, she smashed panes of thick plate glass by standing on her bedstead and hammering the glass with her elbows. All the main structures were severed down to the bone bilaterally, and necessitated extensive surgical repair. Following convalescence, patient reverted to her usual behaviour and so leucotomy was decided upon.

Conduct and progress following leucotomy, 23.vi.47.—Operation was performed under local anaesthesia. During the proceedings she co-operated extremely well and appeared to enjoy the attention and position of importance which she found herself to be in.

Following operation, apart from being slightly confused on the second day, she made an uninterrupted recovery. She became co-operative and pleasant, polite to the nurses, placid and calm, and began to do things for herself, and took an interest in her appearance. She refrained from using bad language and exhibited a degree of shyness or self-consciousness when she heard other patients swearing.

She now began to exhibit an interest in the welfare of other patients, and as to conduct generally, this was above reproach.

She was set to work in the Nurses' Residence in a position of trust and with a certain degree of liberty. Her work there improved and she took a pride in any task given her.

28.iii.48: Interviewed. Some months ago (and recently) her memory for events recent and remote was good.

She enumerated the way in which she had improved, as follows:

(1) I no longer wish, or feel a desire or impulse, to do myself harm.

(2) I do not now get feelings of depression.

(3) I do not now feel impelled to smash windows; previously this idea had a fascination for me.

(4) I sleep well and I have no wish to have sedatives or sleeping draughts.

(5) I do not wish any longer to attract attention to myself.

(6) Every day seems the same now.

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She has been out shopping on several occasions and after the initial feeling that people were looking at her, that she was conspicuous, she soon forgot her embarrassment and enjoyed the outings.

In this case I think several points are worth noting:

(*a*) Behaviour over which she had no control.

(*b*) Behaviour which gave her morbid pleasure because of all the trouble and excitement it caused and the part she was playing in it.

(*c*) The immediate improvement and the peace of mind following many years of fevered conduct and a mind in ferment.

(*d*) The statement that every day seems to be the same.

(*e*) The statement that she does not want to be bothered with (or interested in) misbehaving!

(*f*) The statement that noise and excitement cause her to become a little confused and she wants to detach herself from, instead of joining in, any excitement.

She looks well, has a good sense of humour, and is an excellent worker.

Was transferred to an ordinary M.D. Colony in July, 1948.

E. M. H— (female), born 23 May, 1933; admitted 13 June, 1942, aged 9 (? unique age).

Previous history. Family.—The parents appear to be normal people of average intelligence, and the other children of the family are normal.

Mental deficiency was first observed in early childhood.

Summary of conduct prior to admission.—Before admission to a C.I., it is reported that this child was destructive, spiteful to other children, and cruel to animals, liable to sudden outbursts of violence, in which she attacked others and tried to injure herself. She smashed windows, struck her head against the wall. She frequently destroyed her clothing and bedding and was actively dirty in her habits.

Mental state on admission.—Her intelligence was far below the normal for her age. She could name only a very small range of common objects, and her articulation was defective. She answered questions in monosyllables and could not sustain the simplest conversation. Her mental age was assessed at 4½–5 years.

Conduct and progress at Rampton up to 8.xi.47 *when leucotomy was performed.*—This child was violent and filthy in habits from admission till the date of her leucotomy. She made impulsive attacks on the other children, and if not restrained would have caused them serious injury. At times she had outbursts of screaming lasting several hours and violently struck her head against the walls of her room. Her sexual habits were depraved and she frequently smeared her body and the walls of her room with faeces. She proved completely unresponsive to training. Latterly it was necessary to accommodate her in the special observation ward for her own safety and to avoid injury to the other children.

Conduct and progress following leucotomy.—In the immediate post-operative period the patient was restless and noisy, used obscene language and struck at nurses and attempted to bite them. This phase lasted for two days, after which she became quiet and co-operative. She was incontinent of urine for a few days and for about a week she was apt to destroy her clothing by picking. Thereafter there was a dramatic improvement in her conduct and mental state. She has responded well to re-education and has been clean in her habits and person.

She has rapidly acquired normal social accomplishments such as eating with a knife and fork instead of bolting her food like an animal and she is both pleasant and amenable. She is still, however, somewhat greedy and will go on eating indefinitely if not stopped. Since the early days of the post-operative period she has not exhibited the slightest degree of violence.

Present mental state.—She is now attending our school.

Formal testing has not yet been carried out, but there has been definite improvement in her general intelligence since the operation. She shows fair powers of concentration and will persevere with simple handicrafts.

Towards the staff she is friendly, and her parents have noted that she is much more affectionate towards them.

In this case the change can be regarded only as dramatic and the youthful age makes this case of peculiar interest. Despite her imbecility there is a peculiar intelligence which enables her to understand simple conversation, and she is quite observant. In fact she has even a sense of humour.

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During a recent interview she could give her attention to simple questions, and addressed individuals present by name. Expressed the wish to go home to her parents, and asked me when we were going to have our Sports.

Her appearance is that of a healthy if ungainly child, and the pronounced increase in weight is worth noting. From being a depraved and hopeless little animal she is now quite a sociable, clean child.

I. S— (female), born 2 March, 1916; admitted to Rampton 22 May, 1946.

Previously detained.—Hants M.H. 17 March, 1933, to 18 November, 1936.

Previous history. Family.—Patient is an orphan. She has no known relatives.

Early history.—She was placed in Croydon Orphanage when 18 months old, and remained there until 14½ years of age, when she was sent to a Training Home in Kent.

Summary of conduct prior to admission.—She proved to be quite unmanageable and was sent to Kent Mental Hospital in March, 1933. There she suffered from frequent uncontrollable outbursts of anger during which she was violent and destructive. She suffered from attacks of hysteria and imaginary complaints. On two occasions laparotomy was performed without any abnormality being discovered.

Mental state on admission.—A feeble-minded person who was childish, retarded and ignorant. She failed at simple performance tests and lacked planning power. She was emotionally unstable. She had no shame and indulged in grossly depraved habits. Her language was most obscene. Her mental age was assessed at 9 years.

Conduct and progress at Rampton up to 12.v.47 *when leucotomy was performed.*—Following admission patient complained of pain in her chest. This was investigated and no abnormality was found. She then complained of painful cervical glands which had been produced by compressing the glands with her fingers. She frequently threatened self-injury and suicide. She smashed windows, was defiant, obscene, violent and extremely hostile. These violent episodes lasted from a few days to a few weeks. She became more and more hypochondriacal, demanding frequent medical examination so that other complaints followed, cystitis, vaginal discharge or any condition which she knew about. She frequently produced lesions on her body. Malingering was always followed by a period of smashing and violence. (She dismantled her bedstead and used it as an implement to smash the plate-glass windows of her side-room.)

She was most subversive and plotted vicious sexual attacks on the staff, and appeared to thoroughly enjoy her phases of violence. She lacerated her arms and then removed the sutures, hoping that the doctors would re-suture her. She secreted glass in her vagina and lacerated her arms on returning to her room after having been sutured.

She openly admitted that she liked to experience pain. It was necessary for mechanical restraint to be used for a period as her violence became so extreme. The tension appeared to be mounting and self injury no longer gave patient the relief which it had previously done. Patient readily gave her consent to operation.

Progress following leucotomy.—On 12.v.47 leucotomy was performed under local anaesthesia. Patient co-operated well and chatted continuously whilst on the operating table. She made an uneventful recovery and co-operated with the nursing staff throughout her convalescence. She became happy and contented and took an interest in reading, knitting and embroidery. She frequently sang and appeared to be enjoying for the first time a tensionless care-free life. She apologized when she was rude to a nurse and appeared to be genuinely repentant.

On 25.ix.47 patient became very sullen and bad-tempered, but this mood soon passed off. It was of very short duration and was unaccompanied by any desire to self inflict injury or threats of suicide. She was again repentant and apologized for the inconvenience caused. Regret was something entirely new to the patient's make up.

It was noticed that she became easily tired and was unable to concentrate for any length of time.

She requested to be given a job with some responsibility attached to it, and asked to help the staff with the care of the children in the school. This was granted and she was employed in this capacity, looking after difficult refractory children of various grades. She performed her duties methodically and gave complete satisfaction, but when they became too difficult she asked to be relieved of the responsi-

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bility. She occasionally resorted to bad language, but excused herself because of the trying nature of her employment.

She states that she at last enjoys life and has no inclination to take her own life or inflict injury.

She has become a popular figure and has developed a pleasing gay personality. She now looks to the future and is enquiring if she will be able to leave Rampton sometime in the near future.

This case shows fluctuations in the matter of progress, and although at times we experienced qualms about the ultimate result, I am to-day very optimistic.

During an interview a week ago she struck me as being a pleasant girl, self-conscious and perhaps sensitive, and for whom we must do much to compensate for the sense of inferiority due to her friendless state and illegitimacy, (July, 1948).

A. V. T— (male), born 25 December, 1923; admitted 28 February, 1936, aged 13.

Summary of conduct prior to admission.—At the C.I., T— was described as a nervous child subject to outbursts of ungovernable temper and liable in his rage to break anything he could lay his hands on. He was described as voluble and difficult to restrain at times while at others he was apathetic and sad. He had no interest in manual or scholastic training. He twice attempted to commit suicide.

Mental state on admission to Rampton.—A feeble-minded person. It was difficult to obtain or hold his attention and he had little power of concentration. He was unreasonably apprehensive.

Conduct and progress at Rampton.—During the first five years of his stay he was an impulsive, unstable, excitable youth given to homosexual practices. He became upset over the merest trifles and would then rush wildly about and knock over anything to hand. He frequently had to eat alone as others upset him so easily and he would then smash the crockery. Occasionally smeared faeces on himself and on the walls of his room. He required very careful and tactful handling to avoid outbursts, but even then a month rarely passed without impulsive, noisy, destructive or violent outbursts.

1941–1946: These years showed a little improvement as his outbursts were less frequent, but he remained emotionally unstable, and impulsive.

In December, 1946, his mental age was assessed at 12 years 4 months by Terman-Merill tests and 14 years by Porteus Maze tracing. He had considerable insight and at times asked to be protected from his impulses to smash.

Prefrontal leucotomy was performed on March 19, 1947.

Conduct and progress following leucotomy.—For three months following the operation he lived quietly and contentedly on the hospital and appeared to be mentally at ease. When removed from hospital, however, he soon became discontented, restless, and wandered aimlessly about. He again appeared at times to be under some emotional tension and to be unable to settle long to any job, but his outbursts of excitable and noisy conduct were short-lived. He stated that his worried condition was due to fretting over past sexual malpractices.

It is striking that he appeared relieved for almost three months immediately following his operation, though improvement was thereafter not maintained, without interruption.

Mental condition.—Intellectually he appeared unaltered and his mental age was still just over 12 years.

In March of this year, patient was asked by a medical visitor how he felt since the operation. In reply he said he felt very much better and proceeded to discuss in a vivid and lucid manner how he felt inwardly since the operation. He wished to emphasize that it was not until about four months afterwards that he became aware of an inward peace of mind with freedom from the impulse or urge to do something violent. This contrasts with the record of his progress as described above, and therefore we must assume that this patient had now lost insight into his condition. Did he fail to appreciate that, though improved, he still had emotional outbursts, or did he act impulsively, to a lesser degree of violence than formerly, but without experiencing in the same acute way the urge to do so?

Personally I thought the patient to be still improving, and in conversation it was obvious that the acute anxiety he used to exhibit had largely disappeared and even in his sudden lapses there was not the same explosiveness or viciousness.

Interviewed this month, July, 1948.—His memory for recent and remote events

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is quite good. He is sure that the operation has been a complete success, and describing his feelings he says " the tension with inclination to smash has disappea and the impulse to act in an absurd impulsive fashion is no longer present.

" If the idea enters my mind, there is no positive urge to act upon it." Aga he says, that in his view it was four months after his operation before he experienc a change in his mind. Although in August and October of last year he did experien a short attack of impatience, and repeated once the action of sweeping things the table there seems to me to have been on that occasion an understandal precipitating or exciting factor.

Since October, however, he says, that he has not experienced any tenden to smash or to throw objects. " My mind, he says, for a time, until April, 19 was not so active. I found that the skill I had as a chess-player had deteriorat 75 per cent. I was one of the best chess-players and on three occasions won t tournament, now I was only a very average player." (To substantiate this I shou say that the patient was an extraordinarily good chess-player.)

" When I was doing cross-word puzzles, I found it hard to pick up the clu On the other hand I can enjoy reading now ; previously I lost patience and cou not concentrate on the plot."

Last week (19 July, 1948) he said he had largely regained his skill as a che player, and was amused to think that an inferior player was able, subsequent his operation, to beat him. The same player to-day is no match.

He has been employed for the last three months in the ward pantry where looks after the crockery and he is gratified to note that there is no inclination smash these articles as was his wont.

I am impressed by the steady improvement after a period of uncertainty.

These, then, are examples of cases in which the results appear to be, so fa extremely satisfactory. There are others with equally impressive case-histori in whom we have recorded improvement.

Consideration of our failures and those in whom the improvement is n considerable leads me to think that where there is a definite paranoid attitud especially if it is coupled with organic nervous disease, the operation convey no marked permanent benefit. This is shown in the case of (E. H—), a pos encephalitic with Parkinsonism, dangerously impulsive, who made assault on persons whom he imagined were annoying or persecuting him. Or again i the case of (M. O—), a female patient post-encephalitic whose erotic behaviour sexual perversion, and moral deficiency have remained unaffected althoug physically she has improved considerably. In the case of (M. A—), a hostil schizoid paranoid personality type there has been deterioration, not so muc as to conduct, as in the general mental picture—showing signs, I think, o incipient dementia, with restlessness, distractability of attention, spasmodic loud and hollow laughter, etc.

In conclusion, if we are to set out to determine from an accumulation o evidence from Mental Deficiency Institutions, where leucotomy is contemplated or has been introduced, what type of patient showing psychopathic charac-teristics derives real benefit from the operation, and there were substantial corroboration of the favourable results I have indicated from this group of 20 cases, then a characteristic of the psychopathic state, or of a particular group therein, as expressed in the definitions quoted at the beginning of this paper—that it is immodifiable by any form of medical treatment—may, happily, have to be qualified.

Further, it may be that from the results obtained in a carefully selected group of mental defectives exhibiting psychopathic states that we may glean

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ome information as to the precise clinical types, psychotic or not, that should espond most favourably to the operation.

The majority of these patients have a degree of insight up to and after the limax of their emotional state that enables them to discuss their feelings in a quite rational manner, such as the schizophrenic, for instance, is incapable of.

I have to thank medical officers of the institution for preparing in much detail the case-histories for the purpose of this paper, and I have also to acknowledge the permission of the Board of Control to present this paper to you.

Since this article was first written in April, 1948, those in the markedly improved category have maintained their progress and even shown further evidence of stabilization; no case has relapsed into the failed category. Five cases have been discharged and two more are about to be.

Operations have been resumed and a wider group of clinical types will be submitted for treatment in the course of the year.

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PREFRONTAL LEUCOTOMY IN MENTAL DEFECTIVES.*

By M. ENGLER, M.D.,

Assistant Medical Officer, St. Lawrence's Hospital, Caterham.

SINCE the introduction of prefrontal leucotomy by Moniz in 1936, an ever-increasing number of psychotics have been subjected to this operation. Results have been very satisfactory in certain types of psychosis and psychoneurosis, especially in obsessional tension states, in agitated depression, and in patients with considerable apprehension and anxiety, while less favourable results have been reported in many cases of schizophrenia, hebephrenia, and others. Naturally, with the number of cases operated on, experience has grown, and psychiatrists, neurologists as well as psychologists are nowadays, to some extent, in a position to determine which case is likely to benefit from the operation, and where leucotomy should rather not be resorted to.

It is understandable that, since certain types of brain disorder have responded so well to this operation, one should feel tempted to find out whether other afflictions of the central nervous system might not show good results as well, especially when any other treatment, applied before, had proved ineffective. Ström-Olsen and his co-workers, among their thirty cases, operated on four epileptics with considerable behaviour-disorder, and report much improvement in three cases and slight improvement in the fourth. It would, however, be interesting to hear whether this improvement is still holding good now, nearly five years after the performance of the operations. Thorpe's two cases were delinquents with post-encephalitic disorder of conduct. Freeman and Watts used prefrontal leucotomy in patients who were free from psychosis, suffering from recurrent carcinoma, thalamic syndrome, tabes dorsalis, and trauma to the cauda equina. In all these instances the indication for the operation was relief of pain. Alfred Meyer had the opportunity of investigating the brain of a patient who had been mentally normal but had been suffering from a basal meningioma, and in whom a prefrontal leucotomy had been performed. Although some improvement was noticed in these cases, the results have been far less striking than in psychotics with anxiety or tension states.

At St. Lawrence's Hospital, Caterham, forty-four mental defectives were leucotomized between March, 1944, and December, 1946, the first case by Mr. Crombie, the others by Mr. McKissock or his assistant Mr. McCall. One of the cases must, however, be excluded from this review, as a considerable hydrocephalus of the right lateral ventricle was found during the operation, which had to be abandoned owing to the danger of intracranial haemorrhage.

The ages of the patients, at the time of operation, ranged from 17 to 47

* A paper read at a meeting of the Mental Deficiency Section of the R.M.P.A., April, 1948.

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years, 9 being between 17 and 20, 21 between 21 and 30, 11 between 31 and 40, and 3 between 41 and 47, the average age being 27 years and 9 months.

As to the type of defectives selected, all groups are represented, from feeble-mindedness to lowest grade of idiocy, the overwhelming majority—75 per cent. —being low-grade imbeciles and idiots. Among them were 16 defectives who also suffered from more or less severe epilepsy, and 15 had a superadded psychosis, partly of the paranoid, partly of the schizoid, and partly of the manic-depressive type, with hallucinations, ideas of persecution, and religious insanity ideas. In some of the most intractable cases electric convulsion therapy had been carried out prior to the operation, with either absolutely negative result, or followed by a deterioration of conduct.

It is obvious that no improvement at the intellectual level of these patients was expected, but a change of their behaviour disorder to the better. All these patients, whether feeble-minded, with a remarkably high intelligence-quotient, or low-grade imbeciles and idiots, whether complicated by epilepsy or psychosis or not, displayed more or less the same very severe disorder of conduct. They were restless, excitable, and irritable, had often screaming fits lasting several days and nights, compelling us to keep them secluded, they were destructive to bedding and clothing, wet and dirty, they often had a tendency to self-mutilation, endangering their lives by banging their heads against the walls, or, on the other hand, became so violent that they constituted a permanent menace to the nursing staff or to other patients. In many of them proper control was only possible by either using large amounts of sedatives, or by keeping a nurse permanently at their bedside—so difficult to manage with the present shortage of nurses.

The majority of the operations were performed during 1945 and the first half of 1946. We, therefore, have had the opportunity of observing these patients after their operations for from 1½ to 3 years approximately. I would like to point out here that in compiling records such as this one is easily biased, often quite unconsciously. To avoid this I have interviewed the medical officers in control of these cases, and all the sisters and most of the nurses, who had been in charge of them long before and then after the operations. Only after comparing very carefully their valuable information have we arrived at the conclusions to be recorded now.

The results have been rather unsatisfactory.

Of the 43 patients under consideration, 5, or 13·15 per cent., died between one day and nearly one year after the performance of the operation, one of a subarachnoid haemorrhage on the day following the operation, another 24 days later of cerebral softening—in this case some degree of hydrocephalus had been found at the operation. The third died after six weeks of toxic myocarditis. One patient suddenly collapsed four months after the operation and died, and the fifth survived nearly a year to die of broncho-pneumonia. Unfortunately permission to carry out a post-mortem examination had not been granted in two of the cases, but I have no doubt that their death, directly or indirectly, resulted from the operation, as all had been rather healthy specimens previously.

In 4 of the remaining 38 cases there was a considerable increase in the fre-

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quency and severity of their epileptic fits. One of them has now frequent *status epilepticus* lasting several days, and practically uncontrollable by our orthodox methods. This patient, though epileptic, had never before been in a *status*. Contrary to the findings of other writers, who reported frequent epileptiform convulsions following the operation, which, however, had ceased some time later, not to reappear again, our 4 cases show a definite and lasting deterioration as far as epilepsy is concerned.

In addition to these 4, 3 more patients who had been free from epilepsy prior to the operation started having fits afterwards, one in the first few hours after the performance of the operation, the second twenty days, the third eight months later. In all these cases an increasing number of fits is reported now. 18·41 per cent. of our cases have, therefore, either become worse or had epileptiform convulsions added to their former cerebral affliction. It goes without saying that these convulsions contribute a great deal to their general physical and mental deterioration.

Considering their behaviour disorder, the results were as follows:

Three patients showed and still show a remarkable improvement. One of them should, at least in my opinion, be excluded from the statistical point of view. She is a medium-grade imbecile, half-Chinese, who, on the whole, had been quiet and well behaved. At times she became restless and noisy, and had screaming fits for no apparent reason. After a day or two she would calm down and be her own self again for a considerable time. In this case some degree of arachnoiditis was found at the operation, and a large amount of fluid released. The following dramatic improvement is, in all probability, due to cessation of intracranial pressure.

The two other cases, however, must be regarded as star successes. One girl, a high-grade imbecile with a superimposed psychosis of the paranoid type, had been emotionally unstable, extremely troublesome and abusive, had screaming fits, and required frequent seclusion. Now, nearly two years after the operation, she works well in the laundry. She is still noisy and troublesome at times, but incomparably better than before.

The other girl, a low-grade imbecile with schizoid mannerisms, emotionally very unstable, used to have outbursts of screaming lasting for several days. She is now quiet and well behaved, and is doing a great deal of useful work in the ward. Since the performance of the operation, nearly three years ago, we have had no trouble at all with her.

Seven of our patients, or 18·41 per cent., can be regarded as slightly or very slightly improved. They are perhaps less noisy, less excitable and less violent; some are still wet and dirty. In some of them nursing and supervision are easier than before, but the change is certainly not striking.

Thirteen of the patients, or 34·19 per cent., are absolutely unchanged, and consume the time of our nursing staff just as much as before.

Twelve, or 31·56 per cent., are worse or much worse. They have deteriorated mentally, if such a thing was still possible, are now filthy in their habits, and are real terrors in the wards. They are spiteful, aggressive, use obscene language, they are exceedingly destructive, and many of them have to be kept under restraint.

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Three other patients, two male and one female, became so much worse after the operation that they had to be certified under the Lunacy Act and sent to mental hospitals. The girl, an epileptic, feeble-minded, with a superimposed psychosis, became hallucinated, saw rats and black men in her room, and was often so aggressive that she was a permanent menace to the other patients as well as to the nurses.

Of the two male patients, one showed a remarkable improvement lasting approximately five months. After that he gradually relapsed to his former condition and eventually became absolutely unmanageable, threatening and dangerous.

If we look at this balance-sheet, we find that a very considerable improvement resulted in 5·26 per cent., a slight or very slight improvement in 18·41 per cent. of the patients. In more than three times their number, however, there was either no improvement at all, or such a deterioration of the disorder of conduct that many have now to be kept under restraint, or require more nursing supervision than before, or had to be sent to mental hospitals.

The question now arises: Should one operate on mental defectives exhibiting disorders of conduct, or not?

Before answering this question, let us compare the positive and negative results in our series of patients.

I have just pointed out that in 5·26 per cent. of our cases a remarkable improvement of the behaviour disorder was achieved through the operation, a slight or very slight improvement in 18·41 per cent. With a bit of good will one might, therefore, say that nearly 24 per cent. of those that survived the operation could be regarded as more or less successful. The rest, however, are an utter failure. It is certainly of interest that the great majority of the patients who benefited from the operation belonged to the higher grade, and possessed some personality.

It must be admitted that many of the patients were very quiet and well-behaved immediately after the operation, some of them, in fact, too quiet for our liking. This state lasted for weeks in some, for months in others, then a gradual return to the former condition was noticeable. Similar observations have been made by other investigators as well.

Many factors may account for this phenomenon. First of all, prefrontal leucotomy is not to be considered a minor operation as suggested by some writers. It is a rather serious, if not to say brutal operation, and the severe upset of the nervous system following it may be regarded as a shock from which some of the patients recover quickly, while others require months to do so. That during the state of this upset the patient remains quiet, and exhibits none or only very few of his disorders, can easily be understood. The return to his former condition may be due to the fact that other paths of association take over the function of those destroyed by the operation, as suggested by Golla and by Cobb. This view is shared by Hutton.

Another very important factor is how the operation has been performed, whether the so-called anterior or posterior cut was made, and whether enough fibres have been severed.

Without wanting to go into anatomical details, I may just mention that in

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cases with little deterioration small incisions may be sufficient, while in those with considerable deterioration an extensive destruction of the thalamofrontal radiation is necessary. The most illustrating and interesting investigations by A. Meyer on ten brains of patients who had undergone prefrontal leucotomy demonstrate very clearly how often this aim of the surgeon is achieved either very unsatisfactorily or not at all. And in the cases of Meyer the surgeon had to deal with brains of psychotics, or even one mentally normal individual, where one must assume the anatomical structures to be normal or near to normal.

Take in contrast the brain of a mental defective, especially of one of low or very low type. These brains are asymmetrical, large parts often atrophied, the convolutions very flat and simple, the arrangement of the blood vessels anomalous—in other words the contours are absolutely inconstant, and the poor surgeon is faced with the more than grave problem of how to find the thalamofrontal radiation. I have no hesitation in stating that in mental defectives of low type this bundle will not be cut properly in nine cases out of ten.

We must further take into consideration the mortality rate, which has decreased from 20 per cent. in Lyerly's series and 10 per cent. in McGregor and Crombie's series to 4·8 per cent. in the cases reported by Dax, 2·5 per cent. in those reported by Frank, and 2 per cent. in those reported by Parker. Our fatality rate was 13·15 per cent. I agree with all previous writers that, no matter which method is applied, fatal haemorrhages are unavoidable. If the brain is approached by the technique of Lyerly, who inserted a lighted speculum into the skull, blood-vessels can be seen and pushed back, but rather extensive dura openings are necessary, and the danger of secondary infection and adhesions with their grave consequences increases. If, on the other hand, the blind technique is used, no matter whether with a leucotome or a brain needle, anterior or posterior cuts, thin-walled cerebral vessels, either a cortical vein or a branch of the anterior or middle meningeal artery will in one or another case be injured, and death will follow either immediately after the operation or many weeks later.

Then there is the definite danger of either increasing the frequency of fits or of creating new epileptics. Dax recorded one patient with convulsions after the operation, Freman and Watts, in their initial reports, 3 among 80 patients, Frank 18 among 200 patients, McKissock 4 among 50 patients. A. Meyer mentions one who had died in *status epilepticus* seventeen months after the operation. In our series of patients 4 out of 38 cases became definitely worse, while 3 more started having fits after the operation. This amounts to 18·41 per cent. And I may be allowed to underline that this was not a transitory phenomenon, but a lasting one, contributing considerably to the deterioration of the patients. Whether the technique used in the operation, or adhesions, or any other damage to the brain were responsible for these convulsions is impossible to state. In the case investigated by Meyer no plausible explanation could be found.

Finally, I have to admit that in many of our cases, in addition to the worsened behaviour disorder, a certain degree of mental deterioration has taken

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place. May I now be allowed to outline in a few words the role played by the frontal lobes as regards intelligence?

Ferrier, as far back as 1878, had already stated that our intellectual power depended greatly on our frontal lobes, a view again expressed by Fulton as lately as 1943. On the other hand, Erickson was of the opinion that the frontal lobes had nothing to do with intelligence. Cobb also denied that they were centres for foresight and imagination. Careful study of leucotomized persons and of the changes in their behaviour disorder, especially, however, anatomical investigations of their brains, have contributed a great deal to establish beyond doubt the immense importance of the frontal lobes. Even if one does not go as far as Rees in identifying them with Freud's super-ego, it is now, thanks to the work of Jacobsen, Freeman and Watts, Le Gros Clark and of A. Meyer the consensus of opinion that memory, imagination, social sense, self-consciousness and future planning, all highly intellectual functions, depend on the integrity of these parts of the brain.

Observations on psychotics after leucotomy have led to varying reports regarding intelligence. Hutton, for example, states that personality changes for the worse are frequent findings, but that changes in the intellect are negligible. Ström-Olsen and his co-workers, on the other hand, report a slight deterioration of the intelligence level, which they attribute to the technique used in some cases. Cuts made too far posteriorly have been made responsible for leading to loss of initiative, and gradually to dementia. Rylander, carrying out mental tests on patients before and after leucotomy, found a decrease in the mean of intelligence quotients of his subjects from 93·97 to 83·75—in other words, a deterioration of approximately 12 per cent. And Freeman and Watts made the remarkable statement that failures after operations were due to incisions in the wrong places, or to the fact that the patient had undergone such a deterioration already that he was acting as if he had no frontal lobes at all.

A decrease in the level of intelligence of 12 per cent. as reported by Rylander may not matter very much in a psychotic with a certain personality and an intelligence quotient of 90 or 100 or even more, but must matter a great deal in a mental defective of low grade whose intelligence quotient may be between 20 and 30, or even lower. He can scarcely afford to lose a single point.

Mental tests on our low-grade defectives have taught us how little social sense, imagination or memory they have, and how they are unable to foresee and to plan. The development of their frontal lobes must, therefore, be exceedingly poor if we agree that those functions are invested in them.

If, through the operation, we decrease further this very low intellectual level, and, at the same time, destroy that small amount of personality which they may have possessed without improving their disorder of conduct, we have done them more harm than good.

Taking into consideration the small percentage of real improvement on the one side, the danger of a fatal outcome, of epilepsy, of a deterioration of the behaviour disorder, and of mental deterioration, in a large percentage of these patients, on the other side, we have come to the decision to abandon this

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operation in our mental defectives, and are of the opinion that, at least in those of low grade, it should definitely not be undertaken.

Only those defectives who possess a higher degree of intelligence as well as a higher standard of personality stand a chance of benefiting by the operation without too great a deterioration of their mental level and their personality. I am in agreement with Frank that, before submitting a mental defective to this operation, a very thorough investigation of the quality of his present and past personality should be made.

May I take this opportunity to thank the superintendent, Dr. Lindsay, who has followed the observations on our patients with very keen interest, for all the encouragement, help, and advice he has given me; further, his deputy, Dr. Firmin, who actually selected most of these patients for the operation and supervised them afterwards, for her permission to publish the findings. Special thanks are due to our staff, male and female, who not only carried out their duties with great devotion, often under considerable duress, but assisted me with great enthusiasm in my investigations resulting in this review.

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Part II.—Reviews.

Studies of the "Free" Art Expression of Behaviour Problem Children and Adolescents as a Means of Diagnosis and Therapy. By MARGARET NAUMBURG. New York: Nervous and Mental Disease Monographs, 1947. Pp. ix + 225. Price $5.50.

In this monograph on art therapy in psychiatry six cases are described with clinical details so that their parallel artistic and emotional progress can be followed. The authoress is an art teacher with good psychological knowledge and insight. The patients were all young, and she had initially to coax them to begin expressing themselves graphically at all, since they still suffered from the discouragement of formal school drawing lessons. She had the patience and restraint to succeed in a remarkable degree, and this book will be of great help to psychotherapists. It is a pity that in republishing these six studies the references were again given separately in each case instead of being condensed together at the end of the volume. The 99 illustrations suffer from all being in monotone with mere verbal descriptions of the colours, which are sometimes the most important feature; surely at the high price of this book some of them could have been in colour. These are minor criticisms of pioneer work showing, in Miss Naumburg's words, that "the language of images is the speech of the unconscious." E. S. STERN.

Lawless Youth: A Challenge to the New Europe. London: Allen & Unwin, 1947. Pp. 252. Price 10s. 6*d*.

During World War II a committee of men and women of thirteen nationalities met in London and held a series of meetings at which they discussed in a personal capacity many problems connected with juvenile crime. This instructive volume, which as its keynote outlines a policy of treatment of the individual and not punishment, is the result. Nearly two-thirds of the material includes contributions from Margery Fry ("Treatment not Punishment"); M. Grünhut ("The Juvenile Court: its Competence and Constitution"); H. Mannheim ("The Juvenile Court: its Procedure"); Wanda Grabinska ("The Juvenile Court: Measures to be taken"); C. D. Rackham ("The Juvenile Court: Auxiliary Services and After Care"); and a chapter on "Prevention" by Anonymous. The rest of the book sets out in an appendix critical summaries of the law and practice concerning the treatment of young offenders in ten European countries. A second appendix discusses the Treatment of neglected and problem children in Norway.

Much erudite thought and carefully considered opinions are presented. They are particularly instructive because of the well-balanced judgment of the contributors. The publication at the present time, when social evolution in many countries is delayed and juvenile crime greatly increased, is opportune.

The psychological and psychiatric approach to juvenile crime receives occasional notice in the text. But no section considers this matter in detail. The medical profession was not represented on the Committee, and Dr. Mannheim states that no complete agreement within the Committee was obtained upon the question of the psychological and psychiatric examination of the juvenile offender. The subject necessarily involves many practical difficulties,

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not the least being the fact that reliable examinations are lengthy and adequately trained specialists in this field are few. Mannheim points out the very real danger of encouraging superficiality in this matter. He states that in Massachusetts, one of the most progressive States in the U.S.A. as far as the treatment of delinquency is concerned, the law provides that the Court has to order a thorough physical and mental examination of a juvenile before he is finally committed to an institution. And he quotes from " Juvenile Delinquency in Massachusetts as a Public Responsibility " as follows : " After five years' experience with the law, the Department of Mental Diseases commented on ' the practice in some instances to comply with the law only in letter by having routine examinations made under unsatisfactory conditions.' . . ." Many will agree with Mannheim that, for the time being, psychological and psychiatric routine examinations should be restricted to certain categories of cases selected according to the type of offence, or of offender, or of the kind of treatment contemplated by the court.

The book is by experts for experts, and will influence thought, and it may be believed future practice, in the treatment of juvenile offenders.

W. NORWOOD EAST.

Psychopathology and Education of the Brain-injured Child. By A. A. STRAUSS and L. E. LEHTINEN. New York : Grune & Stratton, 1947. Pp. 206. 46 illustrations.

Alfred A. Strauss has, for a number of years, attempted to distinguish " secondary," " exogenous," brain-injured defectives among the feeble-minded from " primary," " endogenous," hereditary cases of the same range in intelligence. This book represents a summary of his work carried out at the Wayne County Training School, and will be welcome to all interested in this field.

The authors' description of the psychopathology follows that of Goldstein in his investigations on brain injury in adults. They find in *perception* a difficulty in distinguishing objects from their backgrounds, a liability to be distracted by unessential details, and a tendency to perseveration. These symptoms they investigated by various special tests, e.g. the short exposure of cards portraying an object on a figured background, and the copying of patterns with marbles on a board. In investigating *thought* they use sorting tests ; a collection of various objects is given, to be grouped according to likenesses or to suitability for the situations in contrasting pictures ; they find that brain-injured children rely on unessential, far-fetched hypothetical relationships, and are liable to be easily diverted into irrelevancies. For *behaviour* they use a " diagnostic rating scale," a list of pairs of contrasting qualities which, like the tests, distinguish brain-injured defectives from other defectives, and also from young schizophrenics and psychopaths ; the most characteristic features they find to be overactivity, lack of inhibition, incoordination, perseveration and the " catastrophic reaction "—an emotional outburst in the face of difficulties.

Their main principles in education follow from the symptoms. They are : to avoid distraction by using plain surroundings, to check overactivity with obstacles put in the way of the task (e.g. sticks to be placed in holes in a box during counting, and clay to be engraved with a stylus in writing), and to insist that simple ideas are fully grasped before going on to the more complex.

The authors are naturally at some pains to establish the existence of their " exogenous " or brain-injured child, as distinct from the " endogenous " defective. They give figures for differences in the rates of gain in mental age, sex distribution and bodily growth, which are statistically significant. One might, however, question the criteria on which the exogenous cases are diagnosed. These criteria are : a normal family stock, a history of injury, minor

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neurological signs and specific results from the authors' tests. In some of the cases quoted the history is indefinite and the neurological signs are vague, so it would seem that the diagnosis was made principally on the test results. These do appear to select a certain type of child, overactive and distractible; but that this type is due always to brain injury (and that brain injury is not equally liable to produce other types) can hardly be considered established.

No figures are given for the results the authors have obtained by their special methods of education, though in some particular instances, which are described in detail, they have been remarkable. It is to be presumed that statistical results will become available later when the methods have been longer in use, and will indicate how far they may be considered specific for teaching cases of brain injury.

W. MAYER-GROSS.

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* A number of extracts in this section are reproduced from *Chemical Abstracts and Psychological Abstracts*. To the Editors of these two Journals we extend our grateful thanks.

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Some Remarks on the Determination of Proteins in Cerebrospinal Fluid.

(1) Izikowitz' method for fractionated protein determination has been used for analysis of total protein, globulin and albumin in pathological lumbar fluids. Mean errors found are 2·9 per cent. for total protein, 4·5 per cent. for globulin and 2·6 per cent. for albumin; these values being higher than the mean errors given by Izikowitz from his material of normal lumbar fluids. The relation between the titration errors and the concentration has been discussed, as well as other possible reasons for the errors observed.

(2) The small amount of protein present in lumbar fluid can be determined by ultra-violet light absorption measurements. The analysis can be performed on the filtrates instead of on the precipitates.

(3) As precipitant an equimolar mixture of mono- and dipotassium-phosphate is to be preferred to ammonium sulphate. The filtrates can be analyzed whether the determination is done by light absorption or by titration.

(4) Electrophoretical analysis is on account of the low protein content in cerebrospinal fluid not yet a method suitable for clinical investigations.

(5) Spiegel-Adolf and collaborators have assumed the presence of compounds containing nucleic acid, probably nucleoproteins, in pathological lumbar fluids. Abnormal globulin/albumin ratios could perhaps be explained by the presence of nucleic acid compounds. (Authors' abstr.)

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Course of the Blood-Sugar Curve in Mentally Healthy Subjects and in Schizophrenics during Adrenalin Tolerance Tests for a Day and a Night.

A distinct difference in the capacity for overcoming the strain on the blood sugar and pulse rate induced by the authors' tolerance tests is clearly shown. As an attempt at explanation, it is tempting to adopt the term introduced by Cannon (1935), " homeostasis," especially as a number of leading physiologists and clinicians, such as Fulton (1938), MacFarland and Goldstein (1939) as well as White and Smithwick (1942), have endorsed his views. In the terminology of Cannon, it may be stated that the aim of the authors' tests was to bring about a temporary disturbance in the " homeostasis " (equilibrium of the body juices). Such a disturbance can apparently be more easily induced in some mentally diseased than in healthy subjects. Thus, the sympathetic nervous system which, according to Cannon, in all such conditions of danger to the organism, intervenes as a regulator of the internal equilibrium, must react more strongly and at an earlier stage in the mentally diseased. This is indicated by the higher blood-sugar percentage in the reported cases. (Authors' abstr.)

Gynergen Abuse in Cases of Migraine.

In the present paper seven cases are described in which a great increase in the frequency of the attacks followed on Gynergen (ergotamine tartrate) medication. Apart from an increase in the headaches, these patients suffered from constantly feeling sick, and in two cases cramps were also met with.

In all cases mentioned, the patients had been permitted to dose themselves with Gynergen—in six of them from two injections a week to two a day were taken; the seventh took large quantities of tablets.

In three of the cases the patients refused to give up their abuse of Gynergen for different reasons. Three gave it up entirely, and a very great improvement took place at once. In the seventh case the use of Gynergen was reduced, and the frequency of the attacks also lessened.

With increasing frequency of the attacks it will often be appropriate not to increase the dose of Gynergen (or allow the patient to give himself injections); in such cases it will probably be better to try the usual periodical medication with small doses of phenobarbital or Bellergal, and possibly a change of milieu, etc. (Author's abstr.)

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Preliminary Studies on a Possible Serum Toxicity in Schizophrenia.

The positive result of the investigations may be said to be that, with the technique adopted, a significant difference in serum toxicity can be shown between a group of catatonic and hebephrenic patients on the one hand and a group of normal subjects on the other; and that this difference is presumably in some way connected with a hemolytic principle in the serum of both groups. The task with which the author is now confronted is—by a considerable increase of the existing material and a more thorough analysis thus facilitated—to endeavour to ascertain

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whether this difference is really connected with the schizophrenic disease and not with secondary factors, such as medication, diet, essentially different modes of life, and so forth. (Author's abstr.)

Investigations into the Metabolism of Androgen in Normal-haired and in Hypertrichotic Schizophrenic Women.

Determinations have been made of the androgen excretion in a total of 64 women (between the ages of 20 and 60). 29 were normal-haired (10 schizophrenics + 19 with no mental or endocrine affections), and 35 were hypertrichotic (masculine-haired) (33 schizophrenics + 2 with other psychoses). The examinations were made according to a slightly modified form of the Zimmerman-Callow colorimetric method, and they were carried out daily on 24-hour urine for 3 or 4 weeks (a total of just over 1000 analyses).

The normal-haired women excreted on an average 4·2 mgm. " steron " in 24 hours; those who were under 41 years of age excreted on an average 5·3 mgm., while those over 40 excreted on an average 3·7 mgm. The hypertrichotic women excreted on an average 5·9 mgm. in 24 hours; those under 41 excreted 7·3 mgm., and those over 40 excreted 4·6 mgm. on an average.

The tendency established here to an increased excretion (output) of androgen in hypertrichotic women seemed to be present no matter whether the women suffered from schizophrenia or another form of psychosis, or were mentally normal. This tendency to increased androgen excretion could not be traced in schizophrenic women with normal growth of hair. Thus the androgen output as such seems hardly to play any pathogenetic part for the schizophrenia, but the question suggests itself whether such a part should not be attributed to other functions of the adrenal cortex. Further investigations will have to be made for an elucidation of this question.

The androgen output from the adrenal cortex seems generally to be of importance for the occurrence of hypertrichosis in women. (Author's abstr.)

Some Observations on the Hippuric Acid Test in Schizophrenia.

(1) 69 cases of schizophrenia and 28 normal cases have been tested with the intravenous hippuric acid test according to Quick, and a reduction in many catatonic cases, especially in the so-called active phase, has been established.

(2) If glycine is supplied in cases with reduced formation of hippuric acid, a pronounced or moderate increase is obtained in some cases, while in a smaller group no increase of the secretion is observed. (Author's abstr.)

A Study of the Lipid, Phosphorus and Sugar Content of the Blood in Chronic Alcoholism. I.

A study of 21 cases of chronic alcoholism has been made; 7 cases were classified as delirium tremens, 3 as hallucinosis alcoholica, and the remaining 11 as chronic alcoholism. The results may be summarized as follows:

A rise was found in most cases in the total cholesterol and, to a slighter extent, in the ester cholesterol of the plasma.

The total lipin phosphorus and the ether-soluble lipin-P values were observed to be slightly higher than the normal mean.

The ratio between phosphatides and total cholesterol was in almost all cases below the normal mean.

The following phosphorus fractions were studied with relation to whole blood, plasma, and erythrocytes: inorganic phosphate, pyrophosphate-P, hexosephosphate-P, diphosphoglyceric-acid-P, total acid-soluble, and total phosphorus. As regards inorganic phosphate, hexosephosphate-P, total acid-soluble and total phosphorus no divergences from the normal were observed, at least not to any appreciable extent.

The pyrophosphate-P values were lower than the normal mean in all cases except one in whole blood, and in all cases in the red cells.

The diphosphoglyceric-acid-P values were higher than the normal mean in whole blood in the total number of cases excepting one, and in the red cells in all cases.

The P-fraction values of the plasma varied within the normal limits.

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It is reasonable to assume that the changes in the plasma lipids are due to unvaried and in most cases inadequate diet. The changes observed in the pyrophosphate-P and the diphosphoglyceric-acid-P may perhaps be ascribed to the same cause, although they may be influenced in part by disturbances in the ester synthesis in the red cells caused by chronic alcoholism.

The patient's blood sugar varied within the normal limits, except for one case of mild hyperglycemia. (Authors' abstr.)

A Study of the Blood Bilirubin, Indican and Ketones, and of the Vitamin B_1 Content in the Urine in Chronic Alcoholism. II.

Twenty-one chronic drunkards were examined; of these 7 belonged to the group delirium tremens, 3 to that of hallucinosis alcoholica, and the remaining 11 to that of alcoholismus chronicus. The results may be summarized as follows:

The serum bilirubin was in no case higher than it can be in a healthy, abstaining person who has fasted for 22 to 36 hours.

A rise in the serum indican was observed in barely one-fifth of the cases. This does not support the opinion that indicanemia would be characteristic of some form of chronic alcoholism.

The ketones in the blood exceeded the highest control value in two-thirds of the cases, which indicates a disposition to ketonemia in chronic alcoholism.

In two-thirds of the cases vitamin B_1 was completely lacking, very low, or very near the lowest limit.

The variations from the normal observed in bilirubin, ketones, and vitamin B_1 seem to be chiefly due to the inadequate and unvaried diet which is characteristic of alcoholics. In addition, the low vitamin B_1 values are apparently influenced by gastro-intestinal disturbances of resorption and the greater consumption of vitamin B_1 caused by alcohol. (Authors' abstr.)

Pneumoencephalographic Findings in Some Cases of Leucotomy.

Thirteen leucotomized patients, showing no, or slow improvement after operation, were examined at least one year after operation, with pneumoencephalography. In all these cases signs of a slight to moderate cerebral atrophy were found, in conformity with results previously reported by Freeman and Watts. In four cases porencephalous cysts were observed. The degree of cerebral atrophy and the clinical results of the operation did not show any distinct connection.

(Author's abstr.)

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Prefrontal Lobectomy (Excision of the Anterior Areas of the Cerebrum). A New Form of Psychosurgery.

A new type of psychosurgical technique, namely, prefrontal lobectomy, is described. The advantages of this procedure over prefrontal lobotomy are presented.

The results of prefrontal lobectomy are reported in 14 patients with 85·7 per cent. showing moderate to marked improvement. This series of cases consisted predominantly of chronic schizophrenia, 11 of the cases being classified as dementia praecox. Moderate to marked improvement followed lobectomy in 82·6 per cent. of the latter group of patients. In general, the results for this new psychosurgical procedure compare well with the published reports for prefrontal lobotomy.

(Authors' abstr.)

Intelligence and Emotional Stability.

1. The clinical findings in the examination of over 30,000 men gave a very definitely higher incidence of emotional instability in the men diagnosed mentally retarded than in those diagnosed non-retarded.
2. Down-grading for instability decreased as "M" scores advanced.
3. The rate of decrease in down-grading diminished appreciably in the range of average and superior intelligence.
4. The evidence suggests that the rate of incidence of psychoneurosis and other patterns of emotional instability declines as the degree of intelligence advances, although this becomes much less evident in the upper ranges of intelligence.
5. Possible explanations and interpretations have been discussed.

(Author's abstr.)

Comparative Action of Anticonvulsant Drugs.

A comparative study has been made in a group of institutionalized epileptic mental defectives of the anti-convulsant action of dilantin, tridione, and several barbiturate derivatives. The results indicate that dilantin has the most marked anticonvulsant action in most cases, but that maximum action is only achieved with toxic doses in severe cases. Tridione has definite anticonvulsant action against *grand mal* seizures and is particularly effective in combination with dilantin. Tridione has been successfully used intravenously to terminate status epilepticus and is tolerated in high concentration. Barbiturate derivatives are occasionally effective alone in individual cases but are most effectively used with dilantin.

(Author's abstr.)

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The Myth of Psychopathic Personality.

(1) The concept of psychopathic personality is at present in a transitional state. While most clinical workers in the field still move at the superficial descriptive level, some attempt for delimitation is already being made, though it is still mainly at the descriptive level; while a few, as yet in great minority, are attempting to interpret the reaction in terms of underlying dynamics emphasizing motivation rather than behaviour.

(2) One of the greatest difficulties in the whole situation is that the majority of writers do not offer adequately worked up case material, which therefore precludes a dynamic formulation.

(3) Some workers appear to get away from the previously held concept that the condition is hereditary and constitutional. Instead, the emphasis on psychogenesis appears to be gaining ground. Unfortunately, this remains for the most a statement without casuistic material to support it.

(4) Equally, the grouping is being more and more narrowed, and some workers exclude from the consideration of psychopathy the psychotic reaction types, even if and when they have an undoubted antisocial and delinquent character. But the great variety of hysterical and neurotic conditions are still grouped with psychopathy, when these conditions include some definite antisocial and delinquent behaviour.

(5) On the basis of carefully studied material and due consideration being given to dynamics of the situation, the following reorientation is offered, namely:

(*a*) That what is commonly diagnosed now as psychopathic personality should be divided into main groups; the symptomatic or secondary psychopathy, and primary, essential, or idiopathic psychopathy.

(*b*) Under the heading of symptomatic or secondary psychopathy are to be included those cases of psychoses and neuroses that have a strong antisocial or delinquent aspect, and the case in question should be put into its proper clinical heading (psychosis or neurosis as the case may be). Thus a case may be diagnosed as manic-depressive psychosis, hypomania, antisocial delinquent trends. The term psychopathic, therefore, may be completely eliminated from this group of cases as being only confusing.

(*c*) The clinical worker who puts emphasis on motivation rather than behaviour will have no difficulty in uncovering pointed psychogenesis in all these cases. By the same token they are amenable to psychotherapeutic treatment and therefore offer a far more hopeful outlook than is currently given to psychopathic cases.

(*d*) In the remaining small group are to be put those individuals who do not fit at all into any of the cardinal reaction types; above all they seem to lack any psychogenetic aspect even when definite effort has been made to elicit the same. They form a disease of its own designated as anethopathy, a specific mental disease, characterized by a special personality organization having in particular a virtual absence of any redeeming social reaction; conscience, guilt, binding and generous emotions, etc., while purely egoistic, uninhibited instinctive trends are predominant. They are as close to the constitutional as can be found. The term psychopathic personality may be omitted from these cases too.

(6) With the larger number of psychopathic personality cases being properly put under the respective headings of the cardinal reaction types, and the balance being put in a new group designated anethopathy, nothing remains of the original concept of psychopathic personality, for which reason it should be completely deleted from psychiatric nosology. The term may be left entirely for lay use.

(7) A number of cases have been cited demonstrating the various types of psychopathic personality with emphasis on the dynamics of the situation.

(Author's abstr.)

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The Ceiling Effect of Glutamic Acid upon Intelligence in Children and Adolescents.

1. Glutamic acid accelerates mental functioning in human subjects.

2. The acceleration is general and is not restricted to segments of the intelligence and personality of the individual.

3. The greatest improvement in intelligence and performance test scores occurs within the initial 6 months of treatment, after which the acceleration is diminished and appears to be approaching a ceiling after one year of therapy.

(Authors' abstr.)

Clinical and Electroencephalographic Observations Concerning the Effect of Tridione in Epileptic Patients.

1. Clinically, tridione appears to be of most value in the treatment of the epilepsies associated with cerebral palsies of the milder type. *Petit mal* types responded next best. Tridione appears to be of slightly less value in the treatment of psychomotor epilepsies.

2. Improvement in the EEG, following the administration of tridione, did not necessarily coincide with clinical benefit. *Petit mal* cases showed the best EEG response to tridione. The psychomotor group also manifested EEG response which was somewhat better than that of the spastic group.

3. *Grand mal* types and myoclonias showed consistently the least clinical and electroencephalographical improvement and the greatest number of toxic effects.

4. Severe untoward reactions occurred in 21 per cent. of the cases. Except in 2 cases where severe toxic manifestations were present, clinical improvement did not ensue. Toxic effects were not as evident on the EEG tracings as they were clinically.

5. These toxic effects can be minimized by careful observation in a clinic or hospital and by judicious adjustment of the dosage. However, about 10 or 13 per cent. of the patients did not tolerate the drug well, because of either toxic effect or idiosyncracy, and in these the drug had to be discontinued permanently.

6. In patients suffering from cerebral palsies, tridione exercised a favorable influence not only on the conduct but also on behavior and coordination, particularly in children.

Tridione apparently produced a better effect on cerebral palsies, *petit mal*, and psychomotor seizures than did the anticonvulsant medications which the patients had received previously. (Author's abstr.)

The Use of Ergotamine Compounds in the Treatment of Acute Simple Anxiety States.

A report is made on 59 cases of acute anxiety treated with ergotamine tartrate, 37 cases treated with ergonovine maleate and 36 cases treated as controls with

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calcium lactate. Results are given therapeutically and it is indicated that, while these drugs do act as antisympathetic compounds and to some degree ameliorate symptoms of jitteriness and tension, their potential hazard and the routine required for their administration is sufficiently complex to limit their use to special instances. (Author's abstr.)

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Relation of Personality Problems to Onset and Progress of Multiple Sclerosis.

A number of patients with multiple sclerosis show signs of conversion hysteria either before or after the development of signs of organic disease. The 4 women whose cases are described in detail showed evidence of emotional immaturity at a preadolescent level. They were caught in an entangling neurotic relationship with the mother. There was a tendency to relate themselves to others in a passive way, which led to resentment and hostility. In choosing a husband, they sought a passive person whom they thought intellectually and socially inferior to themselves, in an apparent attempt to assume a dominating role. Sexual relations were never satisfactory. They showed the appearance or accentuation of organic symptoms at a time when the husband became more self assertive and capable.

These patients showed pronounced evidences of vasomotor instability in the extremities. The question arises whether vascular changes in the brain related to the neurotic difficulties could lead, in turn, to organic changes. Since the cause of multiple sclerosis has not been established, it can be thought of as a syndrome, and the data presented here do not necessarily apply in all cases. Psychotherapy offers as hopeful an approach as any other treatment which is now available, and may present one method of understanding these patients better.

(Author's abstr.)

Spatial Organization of Visual Perception Following Injury to the Brain.

Disorders in the spatial organization of visual perceptions were found in 12 patients with cerebral lesions in the parietal and occipital regions. In some of these patients (selected from a large series of patients with wounds of the brain incurred in battle) the disturbance was limited to homonymous quadrants of the visual fields and was most pronounced in circumscribed sectors of these quadrants. In these areas the patients were unable to localize (visually) any stationary (and sometimes moving) object in all three dimensions of space. Two patients showed such errors in localization, predominantly in the sagittal plane. Both showed varying amounts of teleopsia. With the teleopsia, there were concomitant changes in apparent size and brightness. The phenomena appeared with binocular vision as well as with monocular vision with either eye.

Direction and extent of apparent displacements of objects perceived in the involved regions of the field of vision were consistent and characteristic for each patient. On the other hand, the disturbances did not assume an all or none character. The apparent displacements were increased by prolongation of exposure, and they were minimized or abolished on tachistoscopic study. Under certain conditions a complete " reversal " of the abnormal depth effect could be observed, so that persistent teleopsia changed momentarily into " pelopsia " (or the illusion of abnormal nearness).

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In order to get at the functional correlates of these alterations in space perception, a methodical sampling of perceptual and/or motor performances was undertaken. As a result of these tests, it is concluded that the alterations were not produced by a general reduction in " cognitive ability " or any similarly defined intellectual functions, but by systematic changes in function which had taken place in the most implicated quadrants or half-fields. The implicated quadrants and half-fields seemed " weakened " as compared with the less affected regions of the same field of vision or with corresponding areas in the fields of normal controls. It is pointed out that none of the usually accepted theories of space perception can explain why such generalized " weakening " should be associated with an apparent dropping back of perceived objects in space. Evidently, the patients behaved as though the subjective coordinates of their visual space had been permanently altered. It is submitted that such a change can be best described, even though not explained, in terms of a field theory of visual perception.

(Authors' abstr.)

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Electroencephalographic Findings in Measles Encephalitis.

By correlating the known pathologic changes with the known changes that occur in the electroencephalogram in measles encephalitis it seems reasonable to conclude that:

1. During the acute stages of the disease the severe dysrhythmia is due chiefly to the diffuse vascular reaction and the associated influence of toxins on the cortical ganglion cells. Most of these disturbances may subside without permanent damage.

2. The electroencephalographic changes found in the post-acute stages are largely due to subcortical demyelinization and axonal degeneration, with interruption of the fiber connections between the cerebral cortex and the diencephalon. In this connection the influence of the thalamus and the hypothalamus upon the cortical potentials, as demonstrated by Kennard and Nims, should be kept in mind.

3. The focal and lateralizing disturbances in the electroencephalogram tend to correspond to the clinical localizing signs. (Author's abstr.)

The Etiology of Multiple Sclerosis. A Short Review.

1. A brief survey of pertinent facts elicited in the investigation of etiologic factors in disseminated sclerosis has been attempted, with a view to correlating some of the more conflicting concepts.

2. The vascular occlusion theory may be related to that of vasoconstriction or spasm. The vulnerability of the white matter, and possibly of the sympathetic nervous system as a whole, to noxious factors of metabolic, infectious, or other irritative character has been emphasized.

3. The possibility of local allergy, as described by Ferraro and others, does not preclude the possibility of the above concepts, nor does the theory of virus etiology necessarily change the idea of the mechanism involved, although it is possible that the virus theory may hold only in limited cases.

4. It is emphasized that a careful study of the history and nature of the onset as well as of the remissions of the disease be made with the possibility in mind of further eliciting etiologic factors that may become of therapeutic and prognostic significance in the individual cases.

5. A series of careful laboratory studies has revealed somewhat inconstant findings, suggesting possible multiple factors of etiology. (Author's abstr.)

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Effect of Sodium Cyanide on the Human Electroencephalogram.

While testing the therapeutic value of cerebral anoxia in mental disease, sodium cyanide was administered intravenously in varying dosage to seven "healthy" schizophrenic patients. The following changes in the electroencephalogram were noted: Flattening with "attention" during the injection; followed 15–20 seconds later by a short burst of 6–10 per second waves; succeeded by high voltage slow waves and then by flattening. Recovery followed the reverse course of induction. The duration of unconsciousness corresponded closely to the duration of slowing and flattening of the electrical activity and varied directly with the dosage.

During induction with high doses immediate flattening occurred without preliminary slowing. Hence, when anoxia is abrupt and severe, flattening occurs without slowing.

The electroencephalogram obtained during extreme anoxia is difficult to distinguish from that obtained during attention.

CO_2 does not significantly increase the power of the cerebral nerve cells to resist intracellular anoxia. It follows as a corollary that, with low partial pressure of oxygen in the respired air, the antianoxic effect of carbon dioxide resides in its power to improve oxygen transport.

The electroencephalographic changes produced by cyanide are not qualitatively specific for this substance. They are the common outcome of all types of oxygen lack. They resemble the changes produced by depressant drugs, injury, etc. Differences in the electroencephalographic response to various stimuli may be determined by their time course alone. (Authors' abstr.)

Effects of P-Aminopropiophenone on Response-Times of a Conditioned Reflex of Avoidance.

Effects of p-aminopropiophenone (PAPP) on conditioned flexions of avoidance were observed in three dogs. With subcutaneous doses of between 5–10 mgm./K., as 1 per cent. solution in propylene glycol, PAPP tended to produce a lengthening of conditioned response-times. The duration of the lengthening effect tended to increase with the dose. It was independent of seriously toxic effects, and was independent of gross alterations in respiration. Complete blocking of conditioned flexions of avoidance after PAPP was frequent only in a susceptible dog which eventually succumbed.

The lengthening of the conditioned response-times after PAPP is presumably attributable to an anoxia of cortical tissue resulting from methemoglobinemia. An initial chemoreceptive reflex inhibition of the cortex is conceivable, however. (Author's abstr.)

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The Diagnostic Implications of Rorschach's Test in Case Studies of Mental Defectives.

The author made a careful study of 66 children who, on the basis of psychometric examinations, were seriously retarded in their mental development. This study was based upon, not only the psychometric results, but also case history material and the Rorschach test. Rorschach findings were presented on all of the 66 cases in this study, and a few cases were selected for detailed analysis. The results of the Rorschach test imply that mental deficiency has as a necessary component emotional and personality maladjustment. On the basis of the findings of this study the following conclusions are reached :

1. Mental deficiency of the familial and undifferentiated types is, in many instances, a symptom of personality disorder, and it is unlikely that in such cases it represents a failure of the intellect to develop normally.

2. It is quite probable that many mental defectives may be treated successfully by psychotherapeutic techniques.

3. A study of the retarded child is not complete unless case history material and some projective technique is used to supplement the results of the psychometric examination.

4. It is necessary for educators to carry their responsibility further than merely providing a specialized educational programme for the retarded child. They must add to the curriculum a programme of case work with the family and other aspects of the defective's environment and also provide in the curriculum a psychological programme which will help the child meet his emotional needs satisfactorily. Until this is done our school systems will have failed in their responsibility to the retarded child.

5. It is urgent that other investigators continue with studies of this type in order that we may better understand the problem of the feeble-minded, for the results of this and other studies tend to indicate rather clearly that our present concept of mental deficiency may be based upon a set of false assumptions which are inadequate in dealing with the problem. (Author's abstr.)

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Convulsive Disorder and Personality.

1. The author has examined theories about epilepsy, seeking to account for the personalities developed by epileptic individuals. Implicit in most theories, except those the author termed the "stress" and "psychosomatic" theories, is an assumption that there is a typical and fixed "epileptic personality."

2. The experimental findings of various investigators vary but the weight of evidence is against the existence of a typical and fixed "epileptic personality" which characterizes all or even most epileptic patients. Studies of non-institu-

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tionalized, non-deteriorated adult patients using projective personality tests are lacking.

3. The author has compared two groups of sick adults, epileptics and diabetics, on a battery of psychological tests. Significant or near-significant differences emerge in mean Wechsler-Bellevue performance IQ (diabetics are higher), in average time per response on the Rorschach (epileptics are slower), and in average number of " neurotic signs " on the Rorschach (epileptics show more " neurotic signs "). The epileptic group shows on the Rorschach more emotional strain and less acceptance of self than does the diabetic group. Among the author's epileptic subjects, nearly all of whom developed epilepsy in adolescence or adulthood, there is a clear trend toward greater maladjustment with shorter duration of illness.

4. On the whole, however, the groups show far more similarity than difference. Both groups show on the Rorschach drive for achievement but limited productivity, tendencies to constriction and withdrawal, and conflict in their tendencies to be outgoing and to withdraw.

5. Generalizations are of necessity limited because of the small number of cases. Their data, as far as they go, do indicate that there is no typical personality picture which characterizes the epileptic group and distinguishes it from other sick or neurotic groups. (Author's abstr.)

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Problem Solution by Monkeys Following Bilateral Removal of the Prefrontal Areas. VI. Performance on Tests Requiring Contradictory Reactions to Similar and Identical Stimuli.

(1) A series of tests was designed to compare the performance of five normal and five prefrontal monkeys on problems involving contradictory reactions to similar or identical stimuli.

(2) The tests differentiated clearly between the two groups of animals. The performance of the prefontal animals was consistently and significantly inferior to that of the normal group. Error scores averaged for blocks of 30 or 40 tests for each animal showed no overlap between the groups. The best score of each operated animal was in each instance poorer than the poorest comparable score of any normal animal. Evidence was presented to show that the operated animals were well motivated.

(3) Two of the operated animals in this series were previously compared with normal monkeys in delayed reaction studies, and were found to perform as well as some normal animals.

(4) Statistical manipulation showed that it was possible to assign the occurrence of some of the wrong choices to the persistence of erroneous choice-response patterns in both groups of animals. There were no significant differences between the two groups in test series B and C, but the earlier series A showed a virtual absence of the tendency in normal animals as contrasted with a strongly manifested tendency in the operated group. The erroneous choice-response tendencies sometimes persisted for as long as 100 trials on the same test.

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(5) The inferior performance of the operated animals was interpreted as resulting largely from perseverative interference, i.e. from impairment of the ability to relinquish previously acquired, interfering reaction patterns.

(6) It was suggested that performance of human and animals Ss with injury to the prefontal areas may profitably be re-evaluated in terms of the hypothesis of perseverative interference. (Authors' abstr.)

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The Effects of Mild Anoxia on Simple Psychomotor and Mental Skills.

An investigation of the effects of mild anoxia on three simple psychomotor and mental skills has been conducted. The skills studied were finger dexterity, arm-hand coordination and simple addition.

Two hundred and forty-four Army Air Corps Cadets served as Ss. Each S participated in only one experiment. They were divided into sub-groups equal in initial level of performance on the skill in question. The experimental sub-group in each case was subjected to mild anoxia, while the control sub-group was tested always under normal oxygen conditions. The mild anoxia was induced by reducing the barometric pressure in a high-altitude chamber of the variety used throughout the war by the Army Air Forces. Time under anoxia was held constant at 35 minutes, since the study was concerned with the short-duration effects of the anoxic conditions.

The results justify three conclusions: (1) A decrement in level of performance appeared immediately after the introduction of mild anoxia. (2) Following an initial decrement in level of performance rapid adjustment occurred as the time under mild anoxia increased. (3) In addition to the adjustment process there occurred improvement with continued practice under the anoxic conditions.

(Author's abstr.)

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The Differential Effect of Prolonged Mild Anoxia on Sensory and Sensory-motor Reactions and on such Subjective States as Sleepiness, Irritability and Boredom.

At intervals during an eight-hour exposure to an altitude of 10,000 ft. (simulated in a nitrogen dilution chamber), and also during a control run, 16 male college students were given tests of visual, auditory, and sensory-motor efficiency and were asked to rate themselves on 10 subjective conditions, including sleepiness, irritability, and boredom.

The detailed results for three of these measures, previously reported in separate journals, are here summarized, together with some new material, and the differential reactions to prolonged mild anoxia are discussed. The principal findings were:

(1) A progressive and statistically significant increase in the size of the peripheral blind areas of the eye throughout the run. This anoxic effect on the angioscotomata was augmented by a hearty protein lunch.

(2) A progressive and statistically significant increase in sleepiness, feeling of fatigue, boredom, wandering of attention, irritability, headache, and depression, and a corresponding decrease in motivation, coordination, and general feeling of well-being. These maladaptive reactions reached their maximum after 6·25 hours, but were somewhat reduced by an end-spurt after 7·25 hours, when the subjects became aware that their ordeal was almost over.

(3) An appreciable loss of auditory efficiency after 2 to 5 hours when the subjects were tested for their ability to perceive the sounds most frequent in common speech, by methods and materials employed in an earlier study involving a brief exposure at higher altitudes. However, an end-spurt was evident in this test also, suggesting that the poor performance at this moderate altitude was due more to a wandering of attention than to any genuine auditory defect. (In the earlier tests at higher altitude, a significant loss in the ability to perceive speech sounds occurred at altitudes as low as 16,900 ft.)

(4) No loss of efficiency on such a simple test of eye-hand coordination as the Minnesota Block Test, in contrast to the other positive findings.

As judged by the magnitude, persistence, and statistical significance of the changes at altitude, and by the relative imperviousness to subjective compensatory effort (the absence of an end-spurt), the angioscotoma test appears to be the most sensitive indicator of the encroachments of prolonged mild anoxia on the subjects' efficiency.

Taken as a whole, the results indicate a moderate but progressive loss of efficiency and a generally poorer emotional adjustment as the exposure to the relatively low altitude is prolonged. (Author's abstr.)

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EEG Changes Induced by Water Intoxication.

Water intoxication gave rise to low frequency activity in the EEG in nearly all the subjects studied in this series. The bioelectric charges observed are similar to those produced by insulin-induced hypoglycemia and oxygen poisoning.

The pitressin water test is not a specific test for epilepsy.

Water intoxication, in common with hypoglycemia and oxygen metabolism collapse, is probably a phenomenon of intraneuronal dysfunction.

In certain epileptics a positive water balance apparently disturbs already poorly functioning neurones, as determined by the EEG low frequency activity, and thereby acts as the detonating mechanism for the convulsive discharge.

The absence of abnormal brain electric activity in water intoxication does not indicate that the observed patient does not suffer from clinical epilepsy. As a diagnostic test for epilepsy in the type of patient herein reported, pitressin hydration is of limited value. (Authors' abstr.)

Study of Carbonic Anhydrase in 37 Brains with Reference to Symmetry of Distribution.

Data are given from the examination of 37 brains in which a total of 138 comparisons of carbonic anhydrase content from the same areas in the right and left

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hemispheres were made. These would seem to indicate focal irregularity of quantitative distribution of that enzyme in diffuse organic brain disease and in the presence of a chronic pathogenic stress capable of affecting the brain. This degree of irregularity was not found in the absence of such organic compounds. (Authors' abstr.)

DECEMBER.

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Tubercle Bacilli in C.S.F. of Dementia Praecox. *Darke, R. A.* . . . 686

Serial EEG's in Brain Injury.

There is a definite effect of time on serial EEG findings following cerebral trauma. Percentage of EEG improvement increases as time lapses after injury. The wider the cranial injury, the greater the likelihood of eventual EEG normality. " Amplitude asymmetry " is a valuable indicator and localizer of cerebral trauma. (Authors' abstr.)

Three Types of Thinking Disorder.

The behavior of selected groups of schizophrenics, general paretics and cerebra arteriosclerotics on sorting tests which utilized words and numbers as manipulative objects, indicated that the three diagnostic categories tended to be behaviorably distinct from one another in a statistically significant manner.

These differences were demonstrable in terms of the patients' performance and their explanation of that performance. The schizophrenics were found to perform generally in an operationally defined " co-ordinated " manner, and to offer an explanation for their performance. General paretics tended to perform in an operationally defined " unco-ordinated " manner, and to offer no explanation for their performance. Cerebral artieriosclerotics tended to perform in an " unco-ordinated " manner that was statistically no different from that of the general paretics, but excused or apologized for their performance.

Schizophrenics and cerebral arteriosclerotics performed generally in a significantly different manner, but were alike in that they both tended to display some critical evaluation of their behavior.

The thinking disorder of the paretic is interpreted as both a deficit in performance potentialities and in organization. The thinking disorder of the cerebral arteriosclerotic is interpreted as a deficit in performance potentialities ; the factor of intellectual organization is essentially unimpaired. The schizophrenic shows no deficit in performance potentialities. His disorder is interpreted as one of organization which appears as a non-correspondence between performance and explanation of performance. (Author's abstr.)

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The EEG Patterns in Experimental Epilepsy.

In monkeys in which chronic recurrent epilepsy has been produced by the application of alumina cream to the motor cortex of one side of the brain, the following typical EEG patterns have been presented:

(*a*) unilateral focus, consisting of irregular random and serial show activity, spike potentials and variants of spike and dome formations;

(*b*) bilateral abnormalities, showing the above features on both sides of the brain.

It has also been demonstrated that subconvulsive doses of metrazol increased the focal discharges where the abnormality was minimal or moderate, but did not appreciably influence abnormalities which were already marked.

(Authors' abstr.)

MARCH.

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Amelioration of Anxiety Symptoms Accompanying the Healing of a Peptic Ulcer. *Ziegler, D. K.* 276

The Significance of Abnormal Electroencephalograms Prior to Electroconvulsive Therapy.

(1) Fifty-six patients all showing abnormal electro-encephalograms were treated with electro-convulsive therapy.

(2) The electro-encephalograms did not retain the marked slow wave activity characteristically observed following electro-convulsive therapy for periods significantly longer than in patients with normal pre-treatment electro-encephalograms, with 6 exceptions.

(3) Two patients developed spontaneous convulsions, which persisted in one of the patients for a long period of time.

(4) Four patients with a history of epileptiform seizures maintained on anti-convulsant medication during treatment showed no tendency to increased seizures.

(5) Patients with signs of arteriosclerosis showed more marked and more prolonged amnesia and confusion than did the remainder of the group, regardless of the character of their electro-encephalograms.

(6) Electro-encephalographic abnormalities of whatever degree do not by themselves constitute a contraindication to electro-convulsive therapy except where a focal or expanding lesion is suspected. (Authors' abstr.)

Heredity as a Factor in Homosexuality.

The application of Goldschmidt's developmental theory, derived from his study of gynandromorphs, gives no evidence in this study of an hereditary etiologic determination of homosexuality in human beings.

Individuals who continued passive sodomy beyond the age of 25 had a greater than expected number of female siblings.

There was a significant deviation from expectance among the siblings of passive penile fellators under the age of 25, with a predominance of male siblings. This deviation was not found in the group of older passive penile fellators.

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APRIL.

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Cerebral Localization of Psychological Processes Occurring during a Two-minute Experience. *Ingham, S. D.* 388

The Basic Pathology of Schizophrenia.

(1) Many persons who appear superficially to be psychoneurotics in early life but show a paranoid personality trait develop into cases of true schizophrenia.

(2) Many persons who show true schizophrenia in later life have the elements of the diagnosis in their personality make-up years before the reactive psychosis develops. It is concluded that they have schizophrenia before the psychosis develops.

(3) Females who later develop schizophrenia commonly have subnormal menstrual function, perhaps even actual amenorrhea sometimes for years before a schizophrenic psychosis develops. They, in common with the males, show a persistent juvenility with inadequacy in the sexual sphere with lack of interest, dyspareunia or maternal inadequacy and emotional instability.

(4) The males show persistent juvenility in sexual as well as in general behavior. They also show outbursts of negativism or violent anger with control of such behavior if they find it necessary to exert the control. Thus they respond to discipline and such response differentiates them from psychopaths.

(5) All groups of apsychotic dementia praecox show intellectual-emotional dissociation, a true splitting of the personality. There is no actual cortical disturbance until possibly very late in the disease. The fundamental pathology must be in the diencephalon, a specific defect, not a gross lesion in the usual sense.

(Author's abstr.)

Studies in Electronarcosis Therapy.

(1) A study of the 17-ketosteroid excretion of a group of psychotic and psychoneurotic patients did not reveal a significant decrease or increase in daily excretion as compared to normals, nor is the rate of excretion significantly different during or after electroshock or electronarcosis therapy; nor was it confirmed that the sleep/waking excretion of 17-ketosteroids was lower in psychotic patients than in normals.

(2) Electroshock initiates a hyperglycemia which reaches a peak of 25 mgm. per cent. above pre-treatment levels 20 minutes after current is applied in *grand mal* reactions, and of 7 mgm. per cent. above pre-treatment levels 10 minutes after current is applied in *petit mal* reactions. In the electronarcosis-treated patients a 52 mgm. per cent. increase occurs 20 minutes after application of current. It is postulated that this may be evidence of sympathico-adrenal stimulation, most intense in electronarcosis, less so in *grand mal* electroshock therapy and least evident in *petit mal* electroshock reactions.

(3) There is no significant change in the blood cholesterol level in either *grand mal* or *petit mal* reactions resulting from electroshock or in electronarcosis.

(Authors' abstr.)

Studies in Electronarcosis Therapy.

In summary of the findings on intellectual functions, we may say: (1) the patients selected for electronarcosis therapy cover the usual range of intelligence, and do not differ from other clinical groups; (2) some of the patients show psychomotor retardation which is found to be associated with relatively good prognosis; (3) the therapy produces no marked changes in intellectual functioning.

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Data on the Multiphasic may be summarized as follows: (1) the patients selected for electronarcosis show scores on the Multiphasic similar to those of other psychotic groups, and they resemble most closely those who respond to electroschock or insulin therapy; (2) patients responding best to electronarcosis tend to have high scores only on the Depression scale; and (3) within the electronarcosis group, the majority of those responding well can be identified, and with somewhat more assurance, more than half of those who respond poorly can be identified without doing injustice to any cases who are marked much improved or recovered after therapy.

The most important theoretical implication of the psychological findings with respect to intellectual functions and personality is that the patients who respond best to this kind of therapy are those who are depressed and show psychomotor retardation. Patients with other kinds of intellectual impairment and with attitudes of social and emotional alienation, ideas of unreality and other psychotic symptoms respond relatively poorly. A secondary implication of the findings, suggested by the similarity of the criteria for poor response to the convulsive therapies (psychotics) and to psychotherapy (neurotics), is that the *Multiphasic* can identify relatively unmodifiable aspects of mental disorder, and that these aspects cut across the traditional separation of the psychoses from the neuroses.

(Authors' abstr.)

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MAY.

Bilateral Fractional Resection of Frontal Cortex for the Treatment of Psychoses.

(1) Bilateral circumscribed extirpation of frontal cortex was done on four psychotic patients. Two made a social recovery. Of the other two, who were deteriorated schizophrenics, one improved sufficiently to be at home under supervision and the other improved only temporarily.

(2) Complications frequently seen following lobotomy did not occur in this series.

(3) This is the first report of bilateral removal of cortical tissue in brains without gross cellular pathology. There were no deleterious effects on behavior.

(4) A more extensive report on a larger series of psychotic patients with circumscribed bilateral cortical ablation will be made shortly. (Authors' abstr.)

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J. NEUROPATH. EX. NEUROL.
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*Kernicterus. *Becker, P. F., et al.* 190
*Histometabolic Change and Neuropathologic Selectivity in the Light of Recent Investigations. *Roizin, L.* 216

Carcinomas of the Tongue in Monkeys with Pathological Changes in the Central Nervous System.

The histopathology of the central nervous system of two cases of carcinoma of the tongue in rhesus monkeys is described.

While the carcinoma in the first monkey was spontaneous in origin, the carcinoma in the second monkey was produced by an injection of an emulsion of the carcinomatous tissue from the first monkey into the tongue of the second.

Motor nuclei of the brain stem and the anterior horns of all spinal cord segments were affected. The lesions were characterized by intracytoplasmic vacuoles frequently containing a small, roundish body and by other severe cell changes.

In order to explain the limited distribution of the lesions in the brain stem and spinal cord, Galkin's experiments have been cited. They demonstrate direct connections between the lymphatic system of the pharynx and the subarachnoid spaces. It is assumed that the etiological factor responsible for the damage of the neurons (carcinoma toxin ? virus ?) invaded the central nervous system via such lymphatics. (Authors' abstr.)

Subcortical Changes in Cerebral Concussion.

(1) Subcortical areas, hypothalamus, nucleus ruber, and cerebellum show in the electroencephalogram quite similar disturbances as those observed on the cerebral cortex, and in some cases the disturbances of these areas may be more intense than in the cerebral cortex. Withdrawal of cerebrospinal fluid preceding the concussion does not prevent the development of these changes of electrical activity.

(2) Following cerebral concussion there may develop, in some instances, edema of the subependymal zone around the aqueduct in the subacute stage and proliferation of the subependymal glia fibers around the third ventricle in the chronic stage. (Authors' abstr.)

A Second Motor Cortex in the Monkey (Macaca mullata).

A second motor cortex has been described in the monkey, lying on the lateral (exposed) and medial (buried) walls of the fronto-parietal operculum and the posterior portion of the insula.

The arrangement of body-parts in this area is roughly that of the arrangement in the second sensory cortex which lies posteriorly, overlapping the motor cortex; the face region is anterior-superior and comes onto the lateral hemispheric surface; the foot region is posterior-inferior, adjacent to the supratemporal plane; the hand region, by far the largest, lies between the others. The movements obtained with 4/second stimulation are individual isolated ones; those from the distal portions of the body are much more readily obtained than those from the proximal portions. In all cases, the movements were contralateral to the area stimulated.

Stimulation of the anterior half of the insula caused respiratory slowing and

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arrest in expiration. Movements of the vocal cords were obtained from the operculum anterior to the inferior precentral dimple. Eye movements were obtained in two monkeys from the anterior-superior portion of the insula near the infrafrontal plane.

Stimulation of the posterior third of the superior (buried) surface of the middle temporal gyrus produced ipsilateral twitches of the pinna; stronger stimulation caused spread to other muscles innervated by the facial nerve.

(Authors' abstr.)

Kernicterus.

Seven cases of kernicterus are described. They were all associated with erythroblastosis fetalis. This condition was confirmed in the authors' cases by means of serologic and histologic studies. In five cases the infants were Rh positive and the mother Rh negative with anti-Rh agglutinins. In one case the erythroblastosis was presumably due to the A factor and in another case the erythroblastosis was due to the Rh factor.

Slow movements of the extremities, suggestive of choreoathetoid movements were recorded. In five cases, jaundice appeared during the first day of life; postmortem studies disclosed the discoloration to be present most frequently in the following structures: hippocampus, basal ganglia, midbrain, medulla and floor of the fourth ventricle. The microscopic findings, except for the sixth and seventh cases, were uniform. In regions grossly bile-stained the nerve cells were shrunken and stained readily with eosin, some containing dark staining nuclei. Some nerve cells displayed poorly stained cytoplasm and vacuolization. These alterations are not improbably the result of venostasis. No alterations of the glia cells, microglia, or connective tissues were detected.

In two cases, there was yellow pigment present in scattered nerve cells in the hippocampus, basal ganglia, pons, cerebellum (Purkinje cells) and medulla oblongata (olives).

Perivascular aggregations of undifferentiated neuro-epithelial cells were found scattered in their usual distribution. Extramedullary erythropoiesis, chiefly in the liver and spleen and visceral hemorrhages were other anatomical findings.

(Authors' abstr.)

Histometabolic Changes and Neuropathologic Selectivity in the Light of Recent Investigations.

An attempt has been made to emphasize the correlation between the morphologic and histometabolic organization of the nerve cells, to demonstrate the interaction between histometabolic components of the nerve cells and various endogenous and exogenous processes and to trace the interrelationship between various histometabolic disorders (histometabolic dysergia) and certain neuropathologic conditions.

Attention was drawn to the fact that cell activities in physiologic conditions are in a state of structural as well as functional balance (integrated structure-function synergism). This anatomo-functional unit is not acting as an individual particle but acts through various neural, vegetative, and hormonal reflexes, as an integrating part of the entire system. If this mechanism is disturbed by one or several of the factors which may be structural or functional in nature, a state of histometabolic dysergia may take place.

It was stressed that histometabolic dysergia is not sufficient in itself to bring about a pathologic disorder but represents a potentially reversible condition of predisposition or sensitization to vulnerability which, if aggravated by additional endogenous or exogenous precipitating factors, may react along certain functional or structural patterns, thus leading the way to a more or less permanent pathologic disturbance of the involved system.

Although it is necessary to realize that there is probably in each case an interplay of several factors, it seems reasonable to believe that histometabolic dysergia may play a very important pathogenic role in determining patterns of reaction and neuropathologic selectivity in various neurologic and psychiatric conditions.

(Author's abstr.)

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*The Occipital Alpha Rhythm. *Cohn, R.* 31
*Some Respiratory, Vascular and Thermal Responses to Stimulation of Orbital Surface of Frontal Lobe. *Delgado, J. M. R., and Livingston, R. B.* 39

Total and Free Acetylcholine in Rat Peripheral Nerves.

1. Minced rat spinal nerves synthesize ACh *in vitro*.

2. A variable amount of ACh is synthesized during the determinations of free/total ACh ratios of rat spinal nerves. This synthesis is probably nearly complete within the first few minutes of the extraction procedure.

3. The ACh content of rat spinal nerves is variable. In a series of eleven experiments it averaged about 6 μg./g.

4. The ACh in normal rat spinal nerves is about 70 per cent. water-extractable. The free/total ACh ratio is constant within experimental error.

5. The ACh in the nerves of rats acutely poisoned with DDT or paralyzed by spinal transection or cold block is almost entirely water-extractable. The total ACh content of the nerves shows no change. (Authors' abstr.)

Absence of Spinal Cord Regeneration in the Cat.

No evidence was obtained of any regenerative power from the upper or lower ends of transected spinal cords in cats. A note of warning can be sounded on the basis of a fortuitous section which might have been interpreted as representing regeneration save for the persistence of a ganglion cell in the midst of the fibers in question. (Authors' abstr.)

The Cingular Gyrus: Area 24.

1. Electrical stimulation of area 24 causes respiratory, cardio-vascular and pupillary responses as well as piloerection. It also causes profound suppression of all motor activity, abolition of the deep reflexes and suppression of the electrical activity of the cerebral cortex. It may evoke complex bilateral tonic movements.

2. Marchi degeneration extends from area 24 through the cerebral peduncles to the medial reticular formation of the pons.

3. Ablation of area 24 causes a loss of fear of man, social indifference to fellow monkeys and loss of mimetic activity, grooming and signs of affection.
(Author's abstr.)

Phasic Inhibition of the Light Reflex of the Pupil During Retinal Rivalry.

The pupillary reactions to short foveal flashes of constant intensity striking one eye were observed during retinal rivalry in normal subjects. A flash of suitable intensity, arriving during the phase of dominance of the stimulated fovea was shown to have a greater chance of eliciting a pupillary contraction than one arriving during suppression of the fovea. This shows that during rivalry a phasic inhibition possibly as far down as the level of the retinae takes place. The similarity with the retinal inhibition in cases of squint, previously demonstrated by other investigators, is pointed out. (Authors' abstr.)

The Occipital Alpha Rhythm. A Study of Phase Variations.

1. The pericalcarine cortex forms four functional oscillators of potential difference.

2. The potential fields (or dipoles) of the oscillators are oriented with maximum negativity around the calcarine fissure.

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3. Thus certain out-of-phase electric activity may be observed as a result of the orientation of the potential fields.

4. Other apparent out-of-phase activity is the result of variations in frequency of the generators of potential difference.

5. The frequency regulation of any pericalcarine oscillator is not generally constant, but fluctuates around a mean value.

6. Precision methods are presented for the recording and observation of phase relations of the potential waves derived from the human brain.

(Author's abstr.)

Some Respiratory, Vascular and Thermal Responses to Stimulation of Orbital Surface of Frontal Lobe.

1. Electrical stimulation of the orbital surface of the frontal lobe in the dog and monkey results in certain blood pressure, respiratory and thermal responses.

2. An almost instantaneous fall in blood pressure (8–10 mm. Hg) resembling vagal effect may occur on stimulation of the orbital surface. Or there may be a slow rise occurring after a delay of 5–10 seconds and lasting about 30 seconds. In the monkey respiration can be arrested at any phase of the respiratory cycle by stimulation of active cortical areas in the region of the posterior orbital gyrus. In the dog respiration can be inhibited, but without complete arrest, by excitation of the lateral olfactory gyrus. Blood pressure and respiratory effects have slightly different thresholds and each can be obtained independently.

3. Mechanical, thermal and electrical excitation of the cortex of the orbital surface may result in a rapid rise of 6–8° F. in temperature of the extremities.

4. After bilateral chronic ablation of the posterior orbital gyrus in the monkey, temperatures of the extremities are markedly elevated and show less pronounced and less prolonged reaction to cold environment.

5. The frontal lobe has much cortex hidden within depths of sulci. Certain cortical areas in the sulcus principalis of the monkey and sulcus presylvius of the dog closely approach the cortex of the orbital surface and appear to have related function.

6. Changes in frequency and intensity of stimulation in the same cortical point are capable of bringing about different effects and may serve as a means of distinguishing different functional components of a single region.

(Authors' abstr.)

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*Effect of Nicotine on Spinal Synaptic Conduction and on Polarization of Spinal Cord. *van Harreveld, A., and Feigen, G. A.* 141

The Electroencephalogram in Experimental Concussion and Related Conditions.

(1) Concussion produced by a blow on the head, or an impact to a plunger in a saline-filled tube leading to the intracranial activity, was accompanied by changes in the EEG which were similar to each other and to those produced by instantaneous or fairly rapid rises of intracranial pressure.

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(2) Such changes produced in the EEG were reversible.

(3) Changes in the EEG with concussion were not specific for concussion.

(4) Of the slow waves produced in the EEG in these experiments, some were synchronous with the heart rate and peaked at the time of the T-wave of the EKG. The basis of these waves was not determined.

(5) The EEG of animals receiving about the body simulated blast impacts of lethal character was not that of concussion. (Authors' abstr.)

Observations on Sensory Paralysis Produced by Compression of a Human Limb.

As a result of study of the sensory changes following the application of pressure to the intact human arm, Lewis, Pickering and Rothschild put forward the view that " sensory nerve fibres become more sensitive to ischaemia as they are traced back from their endings towards the central nervous system."

This work has been repeated, using a more critical technique, and it has been found that the generalizations upon which the theory is based do not survive a close examination. It is possible, however, to explain all the experimental observations in terms of currently accepted physiological principles, by a consideration of some of the anatomical factors involved in compression of the upper limb.

In the course of the investigation it was found that the mechanism of the sensation of touch aroused from the skin appears to be more susceptible to the effects produced by compression of the limb than that aroused from hairs. It is possible that the sensory endings may have some influence in modifying the manner in which the various sensory modalities are lost in compression experiments.

(Author's abstr.)

Observations on Electrical Stimulation of Pain Fibres in an Exposed Human Sensory Nerve.

Condenser shocks were applied to an isolated human digital nerve in which, following the injection of a local anaesthetic into the region, only a few fibres appeared to respond to stimuli. The only sensation which could be produced was that of pain which was felt after a delay of 1·25 seconds following the application of the stimulus. It is suggested that at least part of this delay is due to central and not peripheral factors.

The voltage threshold necessary to elicit pain was determined for a number of condenser discharges of different time-constants. The values so obtained are in satisfactory agreement with the theoretical voltage condenser time-constant curve of Hill, the time-constant " k " being about 6·5 milli-seconds.

The possibilities that one condenser shock gives rise to repetitive impulses in the nerve, and that pain is due to the temporal summation of impulses which singly would not cause pain, have been discussed, and rejected. (Authors' abstr.)

An Anatomical Basis for Alterations in Quality of Pain Sensibility.

Biopsies were taken, after sensory testing of the areas concerned, from a series of patients with either cutaneous scars or areas of partially denervated skin. It was found that in every case where pain of an unpleasant quality could be elicited by means of a needle-prick, the underlying nerve nets and terminals subserving pain were isolated from their neighbours. Conversely, in no case where this isolation was not found microscopically could pain of unpleasant quality be produced. It was also found that alterations in the quality of pain sensibility were not correlated with the presence of morphologically abnormal pain endings. Such endings were, however, associated with disturbances of the threshold of pain sensibility.

Further evidence concerning the association of pain of unpleasant quality with a reduction in the normal peripheral pattern of innervation was obtained from a number of compression experiments on the normal arm. It is considered that this association is a significant one, and that the occurrence of " over-reaction " to painful stimuli in various clinical conditions is caused by a reduction in the normal pattern of impulses presented to consciousness. The suggestions put forward by previous workers have been discussed in the light of this hypothesis.

(Authors' abstr.)

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Site of Action of Acetylcholine.

1. Giant axons of squid were exposed to trimethylamine in 0·02 M and to acetylcholine in 0·1 M. concentration, both labelled with N^{15}. After exposure, the axoplasm was extruded and the N^{15} concentration determined.

2. It was found that the tertiary base, trimethylamine, penetrates into the interior. After 25 minutes' exposure, 7·1 micromoles N were found per gram of axoplasm or 39·5 per cent. of the external concentration. After one hour, the concentration was 15·9 micromoles N per gram as compared with 20 micromoles N per c.c. outside.

3. In contrast, acetylcholine did not penetrate into the interior. In spite of an outside concentration of acetylcholine amounting to 1430 μg. N per c.c., only 86 μg. N were found inside or 0·67 per cent. of the N outside. But even this negligible amount must be attributed to the impurities of non-quaternary N in the acetylcholine which were found to be 55 μg. N per c.c.

4. The experiments demonstrate conclusively why the pharmacological effect of acetylcholine is limited to the synapse in contrast to the well-established physiological role of the ester in the surface membrane during conduction of nerve and muscle fibers. (Authors' abstr.)

Retinal-nerve Interval in the Grasshopper.

Stimulation of the eye of grasshoppers (*Melanoplus differentialis*) results in electrical responses in the visual system that can be recorded in the following order: (i) the retinal action potential, and (ii) a slow negative variation on the surface of the nerve between the optic ganglion and the brain. The latency of these responses, measured from the beginning of the light stimulus, increases as the stimulating intensity decreases. This relationship is such that the time interval between the beginning of the retinal response and the beginning of the optic nerve response, called the retinal-nerve interval, also increases as the intensity of stimulation decreases. This regular increase in the retinal-nerve interval is correlated with a reduction in magnitude of the retinal action potential and an increasing delay in the time of the occurrence of the peak of this action potential. This progressive increase in the retinal-nerve interval supports the hypothesis that the retinal action potential is the process or a sign of the process which is responsible for the activation of nervous elements in the optic pathway. (Authors' abstr.)

Effect of Di-isopropyl Fluorphosphate (DFP) on Action Potential and Cholinesterase of Nerve.

The stellar nerves (giant axons) of squid were exposed to two anticholinesterases, DFP and eserine. The concentration of these compounds in the axoplasm at the time of abolition of conduction was determined.

1. On exposure of the nerves to DFP in two concentrations, 2·2 and 5·5 × 10^{-3} M, the inside concentration was found to be less than 0·5 per cent. of that on the outside. The order of magnitude of the concentration in the axoplasm was 10^{-5} to 10^{-6} M. It varied in four cases from 1·3 to 8·4 × 10^{-6} M, in the fifth being 3 × 10^{-5} M.

2. Upon exposing the nerves to eserine in concentrations varying from 2 × 10^{-3} to 1 × 10^{-2} M, the inside concentration was much higher than in the case of DFP at the time when the action potential had disappeared. When the eserine concentration outside was 1 × 10^{-3} M, that in the axoplasm was about the same. With higher outside concentrations, the eserine inside increased slightly, but not proportionally.

3. The experiments show that the concentration of a compound applied externally to a nerve fiber does not indicate the concentration at the site of action. Some of the many factors determining the effectiveness of a compound applied externally are discussed.

4. Recent claims that conduction is possible in complete absence of cholinesterase activity have been re-examined. It was found that the data stem from use of inadequate technique. (Authors' abstr.)

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Calibre Spectra of Motor and Sensory Nerve Fibres to Flexor and Extensor Muscles.

The tibialis anticus muscle and the gastrocnemius muscle in cats were de-afferented or de-efferented and the number and size of motor and sensory myelinated nerve fibres to the muscles studied separately, using a histological method described by Rexed.

No differences in fibre size were noticed between extensor and flexor. The motor nerve fibres ranged from 2 to 17 microns, and were collected in two groups from 2 to 7 microns and 7 to 17 microns respectively. The peak of the small-sized group lay at 4–5 microns, and that of the large-sized group at 11–13 microns. The sensory nerve fibres ranged from 1 to 17 microns and were collected in three groups from 1 to 4 microns, 4 to 10 microns and 10 to 17 microns respectively. The peaks of these groups lay in the small-sized group at 2–3 microns, in the medium-sized group at 6–8 microns and in the large-sized group at 12–13 microns. Shrinkage was not corrected for.

The number of sensory fibres corresponded to half of all nerve fibres in the flexor nerve, but only to a third of all fibres in the extensor nerve. The flexor nerve thus had a relatively larger number of sensory fibres—chiefly small fibres—than the extensor nerve. A similar difference between flexor and extensor motor fibres was less definite. (Authors' abstr.)

Effect of Nicotine on Spinal Synaptic Conduction and on Polarization of Spinal Cord.

1. Nicotine in small doses (5 mgm./kgm. body weight) suppresses the knee-jerk by central action.

2. The flexion reflex is suppressed by larger doses of nicotine (about 20 mgm./kgm. body weight). This is due to the peripheral curare-like action of nicotine.

3. The monosynaptic spike of the reflex action potential is depressed or abolished by nicotine in small doses (5 mgm./kgm. body weight), but reappears after the administration of large amounts of the drug (100 to 200 mgm./kgm. body weight).

4. The multisynaptic activity is much less affected by nicotine. The changes are qualitatively similar to those of the knee-jerk.

5. Since synaptic conduction in multisynaptic pathways of the spinal cord is hardly suppressed by nicotine, and since the monosynaptic spike, during its depression by small and moderate doses of nicotine, can be restored by appropriate facilitating procedures, it is concluded that nicotine does not interfere with the essential processes of synaptic conduction in the spinal cord.

(Authors' abstr.)

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The EEG in Curarized Mammals.

Evidence for the depression of inter-neural excitability by curare in the mammal is discussed. Data are offered to support the view that the spontaneous resting potentials, of which the EEG is an indicator, remains undisturbed in curarized mammal from rat to monkey. Evidence suggesting the contrary is analysed in terms of possible artefacts arising from types of anaesthesia, dosage of curare and inadequate respiration. (Author's abstr.)

Corticospinal Connections of the Superior Surface of the Temporal Operculum in the Monkey.

The method of physiological neuronography has been applied to the study of the connections of the supratemporal (s.-t.p.) plane of the monkey. The acoustic receptive cortex, lying on the s.-t.p. behind the inferior extremity of the central sulcus, has strong projections to the upper part of the frontal eye field (area 8), the fronto-parietal " face " area (6*b*, 44, 43, 1) and the visual association areas (18 and 19), as well as to other portions of the temporal lobe (areas 21, 22 and 37). It has connections by way of the corpus callosum (posterior fourth) with the homologous cortex of the opposite side.

The extra-auditory region of the s.-t.p. lacks the extensive afferent connections of the auditory cortex ; it fires the neighbouring regions and is connected with its homologue of the opposite side by tracts which traverse the anterior portion of the middle of the corpus callosum.

Other connections of the supratemporal plane with areas in the frontal, opercular, prearcuate and parietal regions are also described. (Authors' abstr.)

Cortico-cortical Connection of the Superior Bank of the Sylvian Fissure in the Monkey.

By local strychninization and recording induced activity, the connections to and from the infraparietal and infrafrontal planes (i.-p.p. and i.-f.p.) and other cortical areas have been mapped in the macaque monkey. These studies, in agreement with cytoarchitectonic studies and the results of stimulation, indicate a fundamental difference between the i.-p.p. and the i.-f.p. ; the dividing line between these two areas probably lies at about the level of the anterior subcentral dimple.

The i.-p.p. corresponds to the second sensory receptive zone of Adrian and of Woolsey. It has afferent and efferent connections with the pre- and post-central convolutions bilaterally. The connections are stronger with the first sensory cortex than with the first motor cortex. In general, the posterior portion of the i.-p.p. is connected with the leg and shoulder regions of the sensorimotor cortex and the anterior portion with the thumb and face regions. There was firing into isolated regions of areas 6 and 8 from restricted zones of the i.-p.p. Extensive connections were found between the i.-p.p. and the parietal operculum.

The i.-f.p. has no connections with the sensorimotor cortex with the possible exception of the face regions, but does project to isolated portions of area 6 and to the frontal operculum on the convexity of the hemisphere.

The i.-f.p. and i.-p.p. are each connected across from one hemisphere to the other homeotopically. There were no projections from the i.-f.p. of one side to the i.-p.p. on the opposite side, whereas region c of the i.-p.p. fired the contralateral i.-f.p. (region e).

The connections of the i.-p.p. and i.-f.p. with the sensorimotor cortex give a somatotopic arrangement which agrees well with that found by Woolsey and others using the method of evoked potentials from cutaneous stimulation.

(Authors' abstr.)

The Babinski Sign.

The extinction of the unilateral positive Babinski sign by effective simultaneous bilateral sensory stimulation has been demonstrated in three patients (transient in one) with ipsilateral (to the Babinski sign) hemidysesthesia.

It is hypothesized that the Babinski reflex may be triggered at thalamic and cortical levels as well as in the spinal cord. (Authors' abstr.)

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Differential Action of Anoxia, Asphyxia and Carbon Dioxide on Normal and Convulsive Potentials.

Anoxia induced by inhalation of 4 per cent. O_2 or of N_2 abolishes convulsive potentials at a time when normal potentials are practically unchanged. On readmission of air normal potentials appear in the previously convulsive areas before the convulsive spikes reappear. There is no indication of an excitatory phase in anoxia.

Asphyxia induced by cessation of artificial respiration abolishes likewise spikes before normal potentials and leads to an earlier reappearance of the latter on readmission of air. In addition, asphyxia causes a temporary excitation characterized by an increased frequency of spikes and, in the normal cortex, by an increase in background potentials and a decrease in dial potentials.

When anoxia or asphyxia is carried out until convulsive and normal, grouped (dial) potentials are abolished, their restitution on reoxygenation is preceded by continuous small potentials which are considered to be the equivalent of the increased post-anoxic excitability.

Convulsive potentials may be replaced in the course of anoxia or asphyxia by dial potentials which were absent in the same cortical area as long as convulsive activity persisted. Moreover, under favourable conditions, progressive anoxia and asphyxia are accompanied by a decreasing spike amplitude while on reoxygenation their magnitude increases. These data seem to indicate that anoxia and asphyxia induce a progressive decruitment of cortical cells and reoxygenation a progressive recruitment. The limiting factor which determines the number of discharging neurons and the degree of their activity (convulsive *is* non-convulsive) seems to be the supply of oxygen.

The restitution of normal oxygenation of the blood after anoxia and asphyxia is often accompanied by a rebound which is shown in the normal cortex in the form of more frequently appearing groups of dial potentials and in the convulsive cortex as increase in frequency of spikes. During this rebound convulsive potentials may appear which were absent under control conditions due to the application of sub-threshold concentrations of the convulsant drug.

Hypercapnia induced by inhalation of 10·6 per cent. CO_2 causes excitation of normal and particularly of convulsive potentials (increase in frequency).

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Unilateral Prefrontal Lobotomy with Relief of Ipsilateral, Contralateral and Bilateral Pain.

Three cases are here reported which indicate that unilateral prefrontal lobotomy will relieve ipsilateral, contralateral and bilateral pain. Symptoms commonly associated with the withdrawal of morphine from patients previously heavily addicted to its use because of pain did not occur following unilateral prefrontal lobotomy in the cases here reported. (Author's abstr.)

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1. Biochemistry, Pathology, Physiology, etc.

Effect of the Injection of Glucose into the Cerebrospinal Fluid. Lackey, Robert W. (Southwestern Med. Coll., Dallas, Texas). [*Science*, **106**, 618 (1947).]

During repeated experiments L. was unable to corroborate the findings of Marinelli and Giunti (*C. A.*, **41**, 5211*a*) that the injection of small amounts of glucose into the cisterna magna results in a hypoglycemic reaction in dogs.

JOHN R. CLOPTON (Chem. Abstr.).

Qualitative Spinal Fluid Protein Determination. A Comparative Study. Binkley, Geo. W., and Johnson, Herbert H., jun. (Western Reserve Univ. School of Med., Cleveland, O.). [*Am. J. Syphilis, Gonorrhea, Venereal Diseases*, **31**, 657–60 (1947).]

Protein analyses of spinal fluids were compared with several qualitative tests for elevated protein concentrations (greater than 40 mg./100 c.c.). Saturated phenol solutions gave positive tests in almost all spinal fluids. Saturated $(NH_4)_2SO_4$ and 5 per cent. phenol solutions gave the most satisfactory differentiation between normal and elevated protein content, the former having a slightly greater specificity.

A. DIETZ (Chem. Abstr.).

The Blood-Glucose Curve in the Tolerance Test and High Glucose in the Spinal Fluid Produced Artificially. Marinelli, Luigi, and Giunti, Valentino (Univ. Perugia). [*Arch. sci. med.*, **84**, 298–302 (1947).]

After the ingestion of 0·75 gm. per kgm. of glucose and while the blood glucose was increasing, a few c.c. of spinal fluid was withdrawn and replaced by a solution containing 0·3 to 0·4 gm. of glucose. The increase of glucose in the blood showed within 10–15 minutes a significant depression, as compared with control tests without spinal injections and the maximum level of glucemia remained lower.

A. E. MEYER (Chem. Abstr.).

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Lipoid Content in the Spinal Fluid in Epilepsy. Carrega Casaffousth, C. F., Brage, Diego, and Rivas, Lucio. [*Semana med.* (*Buenos Aires*), **11**, 81–4 (1947).]

In 18 patients during epileptic attacks and in the intervals the spinal fluid had a high lipoid content with reduction of free cholesterol and fatty acids. While fatty acids were reduced and phospholipides increased during the attack, the blood showed no such changes. A. E. MEYER (Chem. Abstr.).

An Acetylcholine Complex in Nervous Tissue. Welsh, J. H., and Prajmovsky, M. (*Harvard Univ.*). [*J. Biol. Chem.*, **171**, 829–30 (1947).]

The acetylcholine complex found in skeletal muscles has been partially demonstrated in brain and peripheral nerves. The effects of various methods of tissue preparation on acetylcholine are discussed. H. O. SINGHER (Chem. Abstr.).

Effect of Alkaloids on Acetylcholine and Potassium Sensitivity of Striated Muscle. Torda, Clara, and Wolff, Harold G. (*Cornell Univ. Med. Coll., New York, N.Y.*). [*J. Lab. Clin. Med.*, **32**, 1374–7 (1947).]

Shortening of the excised rectus abdominis muscle of the frog was induced by immersion in Ringer solution (1) containing 50 γ acetylcholine-Br per 100 c.c. for 2 minutes, or by immersion in a 20 m. M Cl solution for the same period. Between shortenings, the muscle was washed with (1) for 10 minutes, or with (1) for 5 minutes and (1) containing the alkaloid for 5 minutes. The sensitivity of the muscle to acetylcholine was increased by physostigmine, colchicine, adrenaline (II), ergotamine, pilocarpine, morphine, and yohimbine, and was decreased by atropine (III), amphetamine (IV), cinchonine (V), cocaine (VI), codeine (VII), ephedrine, quinidine (VIII), quinine (IX), strychnine (X), d-tubocurarine (XI) and veratrine (XII). All alkaloids except (II) and (VI) increased K sensitivity. K sensitivity was decreased by (II) and (VI) and, in higher concentrations by (III), (VIII), (IX), (X) and (XI). A curare-like effect was shown by (III), (IV), (V), (VII), (VIII), (IX), (X), (XI) and (XII) in that they induced a decrease of acetylcholine sensitivity in low concentrations which did not modify K sensitivity.

MARSHALL E. DEUTSCH (Chem. Abstr.).

Acetylcholine and Body Temperature. Burn, J. H., and Dutta, N. K. (*Oxford Univ., Eng.*). [*Nature*, **161**, 18 (1948).]

Atropine, benadryl, pethidine, and quinidine cause a fall in body temperature of mice as does procaine. The fall is augmented by adrenalectomy. Since a depressant action on acetylcholine is common to all these substances it is postulated that maintenance of body temperature depends upon a mechanism in which acetylcholine plays a part and that the adrenal glands support such a mechanism against the depressant action of these substances.

BERNARD WOLNAK (Chem. Abstr.).

New Data of the Function of Acetylcholine in the Transmission of Excitation in Neuromuscular Synapses. Angyan, A., and Lissak, K. [*Byull. Eksptl. Biol. Med.*, **23**, 166–8 (1947).]

Short and rapid contractions of isolated muscle fibers of the subhyoid membrane of the frog were observed after small and, sometimes, very small doses of acetylcholine, but no effect on the threshold to indirect excitation was noticed. With larger doses of acetylcholine indirect excitation is caused, and with still larger doses the paralytic action of acetylcholine is observed.

W. R. EICHLER (Chem. Abstr.).

A Substance in Brain which Sensitizes Muscle to Acetylcholine, and a Biological Method for the Determination of Acetylcholine in Nerve Tissue. Babskii, E. B., and Minaev, P. F. (*Acad. Med. Sci., Moscow*). [*Byull. Eksptl. Biol. Med.*, **22**, *No.* 4, 5–8 (1946).]

It was found that emulsions of rabbit or guinea-pig brains in which the acetylcholine (1) was destroyed increased the action of added (1) on the rectus abdominis of the frog. The nature of the increase is not known, although it was found that the K ion produced a similar effect. It is suggested that the difficulty in the assay procedure introduced by this factor can be avoided if the total activity of

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the fresh tissue emulsion is compared with that found after the addition of a known quantity of (I) to the preparation after the complete destruction of the (I) originally present. EUGENE ROBERTS (Chem. Abstr.).

Old-time Antiacetylcholine Medication. Potency and Duration of Action of the Alkaloids of the Poisonous Solanaceae, Morphine, Barbituric Acid, and some Synthetic Compounds as Measured by the Aerosol Method with Guinea Pigs. Favre, M., Frommel, Ed., and Vallette, F. (Univ. Geneva, Switz.). [*Acta Pharmacol. Toxicol.*, **3**, 41–50 (1947) (*in French*).]

The protective action of the compounds in guinea pigs forced to inhale an aerosol of acetylcholine was studied. Atropine (75–100 γ/kgm.), hyoscyamine (50 γ/kgm.), and scopolamine (30 γ/kgm.) were highly protective. Morphine barbiturates, and 2-diethylaminoethyl diphenylacetate (trasentin) had little or no protective action. L. E. GILSON (Chem. Abstr.).

The in vitro *Reversibility of Cholinesterase Inhibition by Diisopropyl Fluorophosphate (DFP). Nachmansohn, David, Rothenberg, Mortimer A., and Feld, Emily A. (Columbia Univ.).* [*Arch. Biochem.*, **14**, 197–211 (1947); *cf. C. A.*, **39**, 3798[1].]

The reversal of the inhibition of cholinesterase by diisopropyl fluorophosphate is dependent on the temperature and the inhibitor concentration. The cholinesterase used in these studies was obtained from the tissues of *Electrophorus electricus* and from the nucleus caudatus of the ox. The percentage of reactivation decreases with time of exposure to the inhibitor; it decreases with increasing temperature and with increasing concentration of the inhibitor. The reversal of inhibition is obtained on dilution of the enzyme inhibitor solution.

VERNON L. FRAMPTON (Chem. Abstr.).

Studies on Cholinesterase. IV. The Mechanism of Diisopropyl Fluorophosphate Action in vivo. *Nachmansohn, David, and Feld, Emily A. (Columbia Univ.).* [*J. Biol. Chem.*, **171**, 715–24 (1947); *cf. C. A.*, **41**, 5155*a*.]

Injection of 1 mgm./kgm. of diisopropyl fluorophosphate (I) into a rabbit is lethal within a few minutes and cholinesterase (II) of the brain tissue is completely inactivated. At the threshold dose of 0·3 mgm. of (I) negligible amounts or none of (II) is found in the brains of those animals that die. But in the brain of the surviving rabbits (II) is always present. In view of the specificity of the action of (I) and the powerful effect on (II) in low concentration, the coincidence of death and inactivation of (II) suggest that the toxicity of the compound is due to its action on the enzyme. H. O. SINGHER (Chem. Abstr.).

Comparative Activity of Serum Cholinesterase and Globular Cholinesterase of Normal Human Blood in the Presence of Folic Acid. (I) *Preliminary. des Marais, Andre (Univ. Laval, Quebec, Can.).* [*Rev. can. biol.*, **6**, 802–7 (1947).]

The cholinesterase of normal human blood is divided into 2 fractions; serum cholinesterase and globular cholinesterase. A study of the activity of each of these fractions by the Warburg manometric method shows that only globular cholinesterase is activated in the presence of folic acid. The action of folic acid, as shown, could form the basis of a method for differentiating between the specific cholinesterase and the pseudocholinesterase.

A. PAPINEAU-COUTURE (Chem. Abstr.).

Effect of Undernutrition and Alterations in Diet on the Cholinesterase Activity of Serum. McCance, R. A., Widdowson, E. M., and Hutchinson, A. O. (Univ. Cambridge, Eng.). [*Nature*, **161**, 56–7 (1948).]

Numerous observations have revealed that the general level of nutrition and certain changes in diet may exert considerable influence on the total or true cholinesterase (I) activity of serum. The results also suggest that the average level of total esterase in the serum is a delicate index of the state of nutrition of any group of men in Germany to-day. Thus a rise in (I) has twice been observed to follow an improvement in the diet of a group of subjects. When weight was

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lost, the (I) content also fell. It is not thought that these increases in (I) were due to digestion, absorption, and metabolism of fat setting free nonspecific esterases into the serum, for when six men were given a supplement of 100 gm. of fat daily for 3 days, there was no increase in total (I) of their serums.

BERNARD WOLNAK (Chem. Abstr.).

Cholinesterase Activity in Cerebrospinal Fluid. Reiss, M., and Hemphill, R. E. (Bristol Mental Hospital, England).]*Nature*, **161**, 18 (1948).]

Cholinesterase activity was determined by Warburg's method at 37·5° and the result expressed in cu. mm. of CO_2 produced by 1 ml. cerebrospinal fluid in a 30-minute period. From 1·6 to 2·0 ml. of the fluid with 0·2 ml. 2 per cent. bicarbonate was put in the main vessel and in the side arm 0·2 ml. of the substrate solutions, which consisted of 0·3 M acetylcholine (I), 0·3 M acetylmethycholine (II), or 0·06 M benzoylcholine (III). The fluid was obtained from patients suffering from organic and nonorganic psychoses. The cholinesterase activities were: (I) 6·6 to 28·4 cu. mm. CO_2; (II) 5·4 to 23·6 cu. mm. CO_2; (III) 2·3 and 6·2 cu. mm. CO_2. The ratios of cholinesterase activity of cerebrospinal fluid to activity of blood serum were: (I) 1/90 to 1/150; (II) 1/8 to 1/40; (III) 1/125 to 1/300. The cholinesterase was not absorbed by Permutit, kieselguhr, or alumina.

BERNARD WOLNAK (Chem. Abstr.).

Selective Inhibition of Pseudocholinesterase by Diisopropyl Fluorophosphate. Hawkins, R. D., and Mendel, B. (Univ. of Toronto, Can.). [*Brit. J. Pharmacol.*, **2**, 173–80 (1947).]

Diisopropyl fluorophosphate (DFP) inhibits both true and pseudocholinesterases, but higher concentrations of DFP are necessary in the case of the former. This renders it possible to inhibit pseudocholinesterase selectively. Acetylcholine is hydrolyzed *in vitro* by both enzymes; therefore this substance cannot be used as substrate to correlate the degree of inhibition of true cholinesterase by DFP and the effects resulting from this inhibition *in vivo*. Since true cholinesterase is responsible for hydrolysis of acetylcholine at nerve endings, its inhibition must be determined when a correlation between anticholinesterase action and pharmacological effects is investigated.

WM. M. GOVIER (Chem. Abstr.).

Influence of the Anticholinesterase Diisopropylfluorophosphate on Cardiovascular and Respiratory Reflexes of Carotid Sinus Origin and on the Pharmacological Actions of Prostigmine and Eserine. Heymans, C. (Univ. Gand, Belg.). [*Compt. rend. soc. biol.*, **140**, 1194–5 (1946); *cf. C. A.*, **40**, 5837[9], 6663[3].]

L. E. GILSON (Chem. Abstr.).

Diisopropyl Fluorophosphate (DFP) and Cholinesterase. Heymans, C., and Jacob, J. (Univ. Gand, Belg.). [*Arch. intern. pharmacodynamie*, **74**, 233–52 (1947).]

Diisopropyl fluorophosphate (5 mgm./kgm.) in nonanesthetized dogs produces convulsions, muscle twitchings, bronchospasm, hyperperistalsis and bladder contractions but no increased blood pressure or change of heart rate. Larger doses slow the heart. Atropine suppresses the effects except the convulsions and muscle twitchings. Nembutal decreases the convulsions. The muscle twitchings persist in denervated muscle but do not occur after axon degeneration. Injection of DFP into the perfused dog head does not increase the direct or reflex excitability of the cardio-inhibitory vagal and respiratory centers.

M. L. C. BERNHEIM (Chem. Abstr.).

Studies on Sleep. IV. Serum Cholinesterase Activity of Chickens when Awake and During Natural Sleep. Frommel, E., Beck, I. T., Favre, M., and Vallette, F. (Univ. Geneve, Switz.). [*Helv. Physiol. et Pharmacol. Acta*, **5**, 361–3 (1947) (*in French*); *cf. C. A.*, **41**, 5626*c*.]

The cholinesterase activity of chicken blood obtained by decapitation is always considerably higher than that of blood obtained by vein puncture. During natural sleep the cholinesterase activity of the serum decreases 10–40 per cent.

L. E. GILSON (Chem. Abstr.).

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Development of Nervous Activity and the Chemical Factors of Nervous Excitation in Chick Embryos. Kakushkina, E. A. (Biol. Museum, Moscow). [*Byull. Eksptl. Biol. Med.*, **22**, *No.* 8, 21–3 (1946) (*in Russian*) : *C. A.*, **41**, 7489*f*.]

Total acetylcholine increased in chick embryos from the second to the fourth day of incubation, dropped on the fifth day, remained almost constant through the seventh day, rose on the eighth day, dropped on the ninth day, and rose again on the tenth day. The activity of cholinesterases did not follow the same pattern. The esterases increased up to the second day, remained approximately stationary on the third day, then increased on the fourth day. From the fourth to the fifteenth day (the end of the period studied) there were minor fluctuations. Kakushkina points out that chickens have a precocious development. Shortly after hatching, they can walk and feed themselves. Their nervous system, therefore, must be developed and ready to function in embryonic life. The early development of acetylcholine esterases roughly parallels the early development of the nervous system. NELLIE M. PAYNE (Chem. Abstr.).

Chemistry of the Nervous System. Alsterberg, G. [*Arkiv. Zool.*, 36*A*, *No.* 8, 13 *pp.* (1945) ; (*Reprint*).]

A review of the author's histochemical studies on the nervous system.
C. L. B. (Chem. Abstr.).

Experiments Supporting the Phase-boundary Theory of the Electric Potential in Nerve. Barnes, T. Cunliffe, and Beutner, R. (Hahnemann Med. Coll. and Hosp., Philadelphia, Pa.). [*Exptl. Med. Surg.* (**3**), 325–9 (1945).]

The old permeability theory of the action current in nerve is inadequate in the light of recent experiments showing the pronounced phase-boundary potential produced by acetylcholine in contact with lipides. The phase-boundary theory provides an explanation of the distinctive electric features of adrenergic and cholinergic nerves. Experiments with oil layers provide a phase-boundary mechanism for the sensitization of oil " membranes " to acetylcholine.
MARION HORN PESKIN (Chem. Abstr.).

Korsakow's Syndrome in Relation to Atrophy of the Brain and Carbon Monoxide Poisoning. Bilikiewicz, T. [*Polski Tygodnik Lekarski* (**1**), 1256 (1946) ; *Brit. J. Ind. Med.*, **4**, 247 (1947).]

Korsakow's syndrome (memory defects, compensatory fantasies, and lowering of the intelligence standard), with radiological evidence of brain atrophy and internal hydrocephalus, and encephalographic evidence of uniform enlargement of all cerebral ventricles were found in a man 21 years after severe CO poisoning. The patient had been in coma for 5 days after the poisoning and had then suffered from grave neuromotor and mental impairment, with improvement after 5 months.
MARION HORN PESKIN (Chem. Abstr.).

A Fluid Electrode for Nerve-stimulation Experiments. Ross, D. A. (McGill Univ., Montreal, Can.). [*Rev. can. biol.*, **6**, 544–7 (1947) (*in English*).]

An electrode is described which fulfills the following requirements : the nerve is kept warm and moist ; fluid of appropriate composition is supplied and removed continuously to remove toxic products of tissue activity ; the c.d. throughout the area in which the nerve is free to move is so nearly uniform that adventitious changes of position produce negligible changes in response ; the nerve can be placed in position easily and maintained there throughout an experiment without risk of mechanical abuse such as stretching or sharp bending ; the electric pathway within the electrode presents to the stimulation apparatus a constant and reasonable electric impedance. A. PAPINEAU-COUTURE (Chem. Abstr.).

Variations in Nervous Excitability Produced in Man by Breathing Air Enriched in Carbon Dioxide. Beyne, J., Chauchard, B., and Chauchard, P. (Sorbonne, Paris). [*Compt. rend. soc. biol.*, **141**, 368–70 (1947) ; *cf. C. A.*, **40**, 5480^{4} ; **41**, 1744*c*.]

Breathing air containing 1·5–6·0 per cent. of CO_2 caused an important increase in the chronaxia of the peripheral nerves after 7–15 minutes. Air containing 0·25–0·50 per cent. caused a transient decrease in chronaxia after 15–20 minutes, followed by a rise to a little above normal. L. E. GILSON (Chem. Abstr.).

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Biochemical Development of the Chick Embryo Brain: Action of Testosterone Propionate. Mandel, P., Stoll, R., and Bieth, R. (Univ. Strasbourg, France). [*Compt. rend. soc. biol.*, **141**, 676–8 (1947); *cf. C. A.*, **42**, 656*c*.]

Testosterone propionate, 0·1–2·5 mgm. in oil, was applied to the embryo at the start or 2 or 7 days after beginning incubation. The growth of the brain was retarded and its lipide content was found below normal when examined on the 13th or 19th days of incubation. L. E. GILSON (Chem. Abstr.).

Biochemical Development of the Brain of the Chick Embryo During the Second Half of the Incubation Period. Mandel, P., Stoll, R., and Bieth, R. (Univ. Strasbourg, France). [*Compt. rend. soc. biol.*, **141**, 416–18 (1947).]

Total protein, total lipides, lipide N, protein P, and lipide P were determined at intervals from the 10th to the 19th day of incubation. The results indicate that during this period nucleoproteins increase less rapidly than the other constituents. The percentage of total ash decreases. The water content decreases from 88·6 per cent. on the 10th day to 84·2 per cent. on the 19th.

L. E. GILSON (Chem. Abstr.).

The Distribution of the Lipoids in the White Matter of the Spinal Cord. Alsterberg, Gustaf (Eksjo, Sweden). [*Arkiv. Zool.*, **36B**, *No.* 3, 1–6 (1945).]

The author's extraction and pregnation method (*C. A.*, **35**, 7433[3]; **36**, 7096[5]) was used on the spinal cord of cow. Alternate extraction with acetone and water gives the carnitine fraction; acetone gives the cholesterol fraction (fatty acids and cholesterol); ethanol, ether, methanol, pyridine, and $CHCl_3$ extracts are combined as the third fraction (lecithin, cephalin, sphingomyelin, cerebrosides); the residue is the dry-substance fraction. Cholesterol and cerebrosides are the chief constituents of the myelin sheath, whereas lecithin and sphingomyelin constitute the axis cylinder. Sphingomyelin is possibly present in the axilemma of Mauthner; perhaps also protein-bound cephalin. Serine cephalin and inosite cephalin are surely present in the glia-structures; cerebrosides and sphingomyelin also may be present; the presence of colamine cephalin is uncertain.

E. VASSEUR (Chem. Abstr.).

Hyperglycemia Induced by the Action of Adrenaline on the Central Nervous System. Leimdorfer, A., Arana, R., and Hack, M. H. (Univ. of Illinois Coll. of Med., Chicago). [*Am. J. Physiol.*, **150**, 588–95 (1947).]

The barrier between blood and cerebrospinal fluid was found to be practically impermeable to adrenaline. Adrenaline injected into the subarachnoid space, although it fails to affect blood pressure or electrocardiogram, causes a rapid, high and sustained rise in the concentration of the glucose in blood. The site of action and the efferent paths are undiscovered in spite of lesions made to prevent participation of the autonomic nervous system and the hypophysis.

E. D. WALTER (Chem. Abstr.).

Central Excitant Action of Diisopropyl Fluorophosphate. Chennells, Mary, and Wright, Samson (Middlesex Hospital Med. School, London). [*Nature*, **160**, 503 (1947).]

Diisopropyl fluorophosphate (I) is a central excitant like eserine, but larger doses of (I) were required to produce similar effects. In large doses (I) produced convulsions violent in character and long-sustained; in decerebrate animals marked increases or phasic fluctuations in tone occurred. Reflex changes such as enhancement of the knee jerk occurred independently of alterations in blood pressure, respiration, or of peripheral potentation of the nerve-muscle response; they are independent of the presence of the anesthetic, chloralose, or of the cerebrum. (I) thus acts on the central nervous system facilitating excitatory transmission in the spinal cord and brain stem. BERNARD WOLNAK (Chem. Abstr.).

The Influence of pH on the Silver Staining of Nervous Tissue. Lascano, Eduardo F., [*Rev. asoc. med. argentina*, **61**, 357–60 (1947).]

The keeping of nervous tissue in 10 per cent. formol for a long time facilitates silver staining owing to acidification of the fixative by the formation of formic acid.

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The same results can be obtained by fixing the tissues in 10 per cent. formol acidified with other acids (H_2SO_4, HCl, CH_3COOH).

E. S. GUZMAN BARRON (Chem. Abstr.).

Gargoylism. Review of the Literature and Report of the Sixth Autopsy Case with Chemical Studies. Strauss, Reuben, Merliss, Reuben, and Reiser, Raymond (Cedars of Lebanon Hosp., Los Angeles, Calif.). [*Am. J. Clin. Path.*, **17**, 671–94 (1947).]

A case of gargoylism is discussed with detailed chemical, clinical, X-ray and necropsy studies. Chemical analyses of the tissues revealed a significant increase of lipide in the lymph nodes, but not in the brain, liver, or spleen. The increase was simple fat, probably in combination with complex protein. The fact that it is not a phospholipide, cerebroside, or cholesterol separates this disturbance from the idiopathic lipide dystrophies. JOHN T. MYERS (Chem. Abstr.).

Biochemical Processes in the Brain in Direct Irradiation by X-rays. Blokhin, N. N., Graevskaya, B. M., and Keilina, R. Ya. (Central Roentgenol. Radiol. Cancer Inst., Leningrad). [*Byull. Eksptl. Biol. Med.*, **23**, 338–42 (1947).]

X-ray irradiation of dog brain, at 160 kv., at 23-mm. distance by using 0·5 Cu–3·0 Al filter, each dog receiving a total of 5 unit skin doses of irradiation in 4 exposures with alternate irradiation of the right and the left temple area, was investigated in respect to biochemical effects by determination of blood sugar (femoral artery and sinus venosus cerebri), spinal fluid sugar, blood serum protein, and the albumin-globulin fractions of the latter. As the total irradiation increased, the total serum protein rose until on the 90th day (after the 1st irradiation) it reached 200 per cent. of the initial value. In the same period the albumin fraction rose by only 26 per cent. for arterial and 32 per cent. for venous blood, while the globulin fraction rose 324 and 323 per cent., respectively. The absolute amount of protein in the spinal fluid remained within experimental variations, but its albumin/globulin ratio gradually changed to 1·0 from 0·56. Arterial blood sugar remained normal, but it fell in the venous blood, until the sugar utilization by the brain at the 90-day period was 370 per cent. of initial. Spinal fluid sugar did not increase. The changes are ascribed to a colloidal swelling of the brain cells, with decreased amount of intracellular fluids. G. M. KOSOLAPOFF (Chem. Abstr.).

Role of the Nervous System in the Regulation of the Absorptive Processes of Carbohydrates in the Animal Organism. Blokhin, N. N., and Lyzlova, S. N. (Lenin Univ., Leningrad). [*Byull. Eksptl. Biol. Med.*, **22**, *No.* 4, 21–3 (1946).]

Dogs were prepared by London's technique of angiostomy with a cannula in the portal vein. The glucose contents of arterial blood from the femoral artery and of venous blood from the portal vein were determined prior to the introduction of 2·5 gm. of glucose per kgm. into the gastro-intestinal tract and at various time intervals thereafter following the injection of calcium gluconate (I) or potassium phosphate (II) into the subarachnoid space. (II), which acts on the sympathetic centers, was found greatly to increase the rate of absorption of glucose. The maximum blood levels of glucose were attained in ½ hour, instead of the 1–1½ hours required when no salt was injected, and a maximum arterial-venous difference of 93 mgm. per cent. was reached. (I), which acts on the parasympathetic centers, caused a marked delay in the rate of absorption ; it resulted in very small arterial-venous differences. The absorption curve in the latter instance is similar to that shown by animals under anesthesia, in which case it has been established that the absorption of glucose becomes a simple diffusion process.

EUGENE ROBERTS (Chem. Abstr.).

Basal Metabolism Affected by Experimental Lesion in the Cerebral Cortex of the White Rat. Wu, Yun-Jui, Chiu, Tso-Lin, and Ping, Chi. [*Contrib. Biol. Lab. Sci. Soc. China, Zool., Ser.* **16**, 97–108 (1942) (*in English*).]

In white rats with fronto-parietal cortical lesions the body temperature was unchanged and the R.Q. deviations were within 10 per cent. of the normal value. Basal metabolism was subject to greater deviations, particularly after fasting, and also underwent cyclic changes. J. G. YOSHIOKA (Chem. Abstr.).

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Sex Hormones and the Nervous System. Chauchard, P. (École pratique hautes études, Paris). [Arch. intern. pharmacodynamie, 74, 286–94 (1947).]

A single injection of sex hormones into rats and guinea pigs causes medullary excitation and cerebral depression regardless of the sex of the animal. Repeated doses cause excitation in all parts of the central nervous system. Excitation produced by folliculin is counteracted by testosterone or progesterone, but the reverse is not true. M. L. C. BERNHEIM (Chem. Abstr.).

Central Nervous Ketosis. Schrade, W. (Städt, Krankenhaus, Arnstadt, Germany). [Deut. Gesundheitsw., 2, 409–11 (1947).]

Injection of air into the cerebral ventricles of rabbits caused a hyperketonemia in about 20 minutes, lasting 1–3 hours. Hyperglycemia also was seen, but the curves of blood-sugar and ketone-body levels seemed to be independent of one another. About 3 or 4 hours after the injection, a hypolipemia lasting 4 or 5 hours was manifested, and in certain cases was followed by hyperlipemia. These reactions are thought to be due to an increase in fat catabolism caused by central nervous stimulation. A human case is described in which a ketosis of about 24 hours' duration followed a cerebral embolism.

MARSHALL E. DEUTSCH (Chem. Abstr.).

Potassium and Periodic Paralysis. A Metabolic Study and Physiological Considerations. Gass, Harvey, Cherkasky, Martin, and Savitsky, Nathan. [Medicine, 27, 105–37 (1948).]

Attacks of paralysis were induced on each of two occasions in a patient with periodic paralysis by the ingestion of 300 gm. of glucose in hypertonic solution. The attacks were accompanied by falling serum K levels but not excessive K excretion, a less sustained fall in serum P level, an increased excretion of creatine and creatinine, and bigeminal cardiac rhythm. A suppression of urinary excretion of both P and K was noted during the phase of maximum paralysis and a rise during recovery. Evidence is presented which supports the hypothesis that hepatic intermediate carbohydrate metabolism plays an important role in periodic paralysis by lowering K content of muscle. F. B. SEIBERT (Chem. Abstr.).

2. Pharmacology and Treatment.

The Effect of Ascorbic Acid in Reducing the Inhibition of Brain Metabolism Produced by Pentobarbital in vitro. *Greig, Margaret E. (Vanderbilt Univ. Med. School, Nashville, Tenn.). [J. Pharmacol. Exptl. Therap., 91, 317–23 (1947); cf. C. A., 40, 5145⁸.]*

Ascorbic can reduce the inhibiting action of pentobarbital (nembutal) on oxidation of carbohydrate by rat brain *in vitro*. It also decreases the acceleration of anaerobic glycolysis provoked by pentobarbital when glucose is the substrate. Cytochrome c increases the effect of ascorbic acid to a variable degree by further reducing the inhibition produced by pentobarbital. It may be that by alternate oxidation and reduction the ascorbic acid acts to provide an alternate route for oxidation; this by-passes the block at the flavoprotein-cytochrome b stage produced by pentobarbital. L. E. GILSON (Chem. Abstr.).

Role of the Liver in the Detoxication of Thiopental (Pentothal) and Two other Thiobarbiturates. Shideman, F. E., Kelly, A. R., and Adams, B. J. (Univ. of Michigan, Ann Arbor). [J. Pharmacol. Exptl. Therap., 91, 331–9 (1947).].

In mice, CCl_4 liver damage significantly prolonged the duration of the effects of 5-allyl-5-(1-methyl-butyl)-2-thiobarbituric acid, 5-ethyl-5-isoamyl-2-thiobarbituric acid (thioethamyl), and Na 5-ethyl-5-(1-methylbutyl)-2-thiobarbiturate (pentothal). Subtotal hepatectomy in rats significantly prolonged the action of pentothal. Diminished blood flow through the liver, as produced by an Eck fistula in rats, increased the duration of action of all three compounds. Pentothal was degraded *in vitro* by rat liver slice and mince.

L. E. GILSON (Chem. Abstr.).

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Effect of Ether and Pentobarbital on the Polarization State of Central Nervous Elements. Van Harreveld, A. (California Inst. Technol., Pasadena). [*Am. J. Physiol.*, **150**, 541–50 (1947).]

The administration of the narcotics, pentobarbital and ether, does not produce a constant voltage between the gray and white matter of the spinal cord. During asphyxiation of the cord, the gray matter becomes negative with respect to an anterior root. Pentobarbital and ether depressed this asphyxial depolarization potential. It is concluded that these narcotics cause a uniform depolarization of the neuron. Asphyxial depolarization potentials were led off from the cerebral cortex, and were similarly influenced by pentobarbital as the spinal asphyxial potentials. An attempt is made to combine these other known effects of narcotics on nervous structures in a theory of narcosis.

E. D. WALTER (Chem. Abstr.).

Detoxification of Barbiturates. Dorfman, Albert, and Goldbaum, Leo R. (Army Med. Research Dept., Washington, D.C.). [*J. Pharmacol. Exptl. Therap.*, **90**, 330–7 (1947).]

Pentothal and seconal are rapidly destroyed in the intact mouse, phenobarbital is destroyed to a lesser extent, and barbital apparently not at all. Rabbit liver slices degrade pentothal, seconal, amytal and pentobarbital, and to a slight extent aleurate. Liver homogenate shows no such activity. Pentothal was the only barbiturate among those tested which was degraded by rabbit kidney slices. Finely chopped rabbit muscle and brain did not destroy any of the barbiturates tested, except for a slight action on pentothal by brain. There is considerable evidence that the kidney breaks down only the malonylthiourea ring, while liver acts on both the malonylthiourea and malonylurea rings. The speed with which the rings are attacked varies with the nature of the side chains.

L. E. GILSON (Chem. Abstr.).

Antagonism Between Barbiturates and Picrotoxin. De Soto, F. Fernández, Núñez, A. Ortega, and Ventura, A. Estades. [*Farmacognosia (Madrid)*, **6**, *No.* 10. 113–51 (1947).]

Dogs and cats who received toxic doses of phenobarbital (I) by mouth or intravenously can be awakened and kept alive with picrotoxin (II). Suboccipital administration of (II) is faster and more intensive than intravenous, and smaller doses are required. As the action of (II) disappears after 1–2 hours and that of (I) lasts up to 5–6 days, repeated injections of (II) is necessary. The value of an oil solution of (II) for prolonged effect is studied.

K. SCHOEN (Chem. Abstr.).

Effects of Dithiobiuret on the Central Nervous System. Altschul, Sol (Illinois Neuropsychiatric Inst., Chicago). [*Proc. Soc. Exptl. Biol. Med.*, **66**, 448–51 (1947).]

Dithiobiuret is an effective anticonvulsant in rats only when given in toxic doses. The most probable site of action is the efferent system of the spinal cord. Moderate doses do not affect the electroencephalogram.

L. E. GILSON (Chem. Abstr.).

The Comparative Value of Pentothal Sodium, Curare, and Magnesium Sulfate for the Modification of Metrazole Convulsions. Rising, Jesse D., and Carroll, M. C. (Univ. of Kansas, School of Med., Kansas City, Kansas). [*J. Kansas Med. Soc.*, **47**, 297–9 (1946).]

Preliminary experiments on fairly large dogs indicated that Mg-SO_4 might be the most desirable " softening agent " were it not for the possibility of sudden cardiac arrest. Pentothal-Na is superior to Mg-SO_4, and far superior to curare as a modifying agent for metrazole convulsions. It has the added advantage of few toxic possibilities. The question of its applicability in the treatment of mental disorders is not settled, but the work on Na amytal justifies the belief that pentothal may be clinically useful.

RUTH BERGGREN (Chem. Abstr.).

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Action of Digitalis Glycosides on the Central Nervous System with Special Reference to the Convulsant Action of Red Squill. Gold, Harry, Modell, Walter, Cattell, McKeen, Benton, Joseph G., and Cotlove, Elaine W. (Cornell Univ. Med. Coll., New York, N.Y.). [J. Pharmacol. Exptl. Therap., 91, 15–30 (1947).]

A study was made of the convulsant and cardiac actions of various principles of the digitalis group obtained from red squill (I), white squill, digitalis species, oleander, convallaria and strophanthus. Contrary to prevailing opinion, the conspicuous convulsant action of (I) in the rat is not only a peculiarity of the drug but also of the rat. Evidence is presented that the convulsant action of (I) in the rat is not due to a special convulsant principle but is a function of its cardiac glycosides or perhaps their genins. Amorphous scilliroside (II) from (I) causes poisoning in the rat by a slow convulsant action on the central nervous system after small doses and by a rapid cardiac action without convulsions after large doses. The white squill glycoside, scillicin, is less potent than (II). (II) acts like a typical digitalis glycoside in frogs, cats and man. Ouabain, folinerin, gitalin and digitoxin (most active) produce convulsions in the rat. There is indication that differences in the convulsant activity of the different digitalis drugs are partly due to differences in fixation or speed of elimination and partly to differences in the molecule structure. The convulsant response of the rat provides a means for their qualitative differentiation.

L. E. Gilson (Chem. Abstr.).

Mechanisms Underlying Pulmonary and Cardiac Complications of Electrically Induced Convulsions. Altschule, M. D., and Tillotson, K. J. (Harvard Med. School, Boston, Mass.). [New Engl. J. Med., 238, 113–15 (1948).]

Pulmonary and cardiac complications of therapeutic electric shock can be minimized by use of curare. A solution of d-tubocurarine is the drug of choice, since intocostrin may contain impurities that dangerously exaggerate the vagal impulses that influence cardiac rhythm.

Marion Horn Peskin (Chem. Abstr.).

Intensity of Brain-tissue Respiration; the Brain and the Muscle Supply of Oxygen, Carbohydrates, and Products of Decomposition of Carbohydrates During Insulin Intoxication. Merezhinskii, M. G. and Cherkasova, L. S. (Med. Inst., Kazan). [Byull. Eksptl. Biol. Med., 22, No. 1, 31–4 (1946) (in Russian).]

Guinea pigs, rabbits and dogs were investigated as to brain-tissue respiration in insulin shock by using the Warburg technique on minced tissue in Ringer-bicarbonate suspension. In guinea pigs the brain tissue shows a Q_{O_2} in insulin shock which is 54·3 per cent. of normal value. In rabbits the white brain substance gave 67 per cent., grey matter 52·2 per cent. In dogs the white matter gave 76·1 per cent., grey matter 63·2 per cent. The animals were killed in the condition of deep coma (3–7 hours after insulin administration). Thus insulin shock leads to severe depression of brain respiration. Analysis of arterial and venous blood (to the brain and to the hind quarters) showed that the supply of glucose to the muscle is depressed (37·8 per cent. of normal in deep coma), although the O supply is substantially normal. As the shock developed, the muscle lost its ability to retain glucose, and the venous blood carried as much as 44 per cent. of normal glucose level; the O in venous blood in this case was 143 per cent. of normal. The brain tissue tends to retain glucose in early shock stage but later begins to lose glucose like the muscle. The venous blood from the brain showed severe increase over normal (164 per cent.). In early shock stages glycogen tends to be retained in the muscle and especially in the brain; in deep shock this tendency is substantially lost. Blood lactic acid rises in early shock (probably because of the convulsions); this condition moderates when coma stage is reached. Brain tissue does not utilize lactic acid but actually supplies it to the blood. Pyruvic acid level does not vary significantly. G. M. Kosolapoff (Chem. Abstr.).

The Metabolic Fate of Chloral Hydrate. Butler, Thomas C. (Johns Hopkins Univ., Baltimore, Md.). [J. Pharmacol. Exptl. Therap., 92, 49–58 (1948).]

Methods, based on the Fujiwara reaction (*C. A.*, **11**, 3201), are described in detail for the separate determination of CCl_3CH_2OH, chloral hydrate, and

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CCl_3CO_2H when present together in plasma. When chloral hydrate is given intravenously to dogs, its concentration in the plasma falls rapidly. CCl_3CH_2OH and CCl_3CO_2H appear very quickly in the plasma and reach such concentrations as to indicate that very little of the chloral hydrate is oxidized and that a high proportion or perhaps all of the remainder is reduced to CCl_3CH_2OH. The disappearance of CCl_3CH_2OH from the plasma is relatively slow, and the concentrations reached are sufficient to account for most or all of the depressant effect of administration of chloral hydrate. L. E. GILSON (Chem. Abstr.).

Influence of Atropine and Scopolamine on the Central Effects of Diisopropyl Fluorophosphate (DFP). Wescoe, W. Clarke, Green, R. E., McNamara, B. P., and Krop, Stephen. [*J. Pharmacol. Exptl. Therap.*, **92**, 63–72 (1948); *cf. C. A.*, **41**, 207*f*.]

Numerous electroencephalograms (EEG) of cats and monkeys are shown. Intocostrin given intravenously in doses sufficient to produce complete skeletal and respiratory paralysis did not affect the EEG pattern. Intravenous DFP produced changes in the EEG which could be prevented or abolished by intravenous injection of atropine or scopolamine. Atropine and scopolamine had no prophylactic or therapeutic effect on convulsions caused by metrazole, strychnine, or gammexane. The experimental data indicate that atropine prevents or annuls the central actions of acetylcholine. L. E. GILSON (Chem. Abstr.).

Comparative Actions of Sparteine and of Procaine on the Autonomic Nervous System. Hazard, Rene, Cheymol, Jean, and Corteggiani, Elisabeth. [*Compt. rend.*, **224**, 1307–9 (1947).]

Sparteine cuts the conduction at the level of the ganglia of the autonomic nervous system; it opposes the action of nicotine and of the nicotine-like substances. Procaine has a formula very different from that of sparteine, but it exercises the same action as the latter. The similarity extends to the modification in excitability of post-ganglionic fibers: both oppose the action of acetylcholine on the heart and arterial pressure, and both accentuate the effects of adrenaline. Only one of the nicotine-like poisons, hordeine, seems to be an exception in that it maintains its action on the arterial pressure and on the intestine in the presence of sparteine, whereas it is suppressed by procaine. In reality when one uses a high dose of sparteine, hordeine exerts no noticeable action on the intestine. A true difference of action is noted between them in the matter of adrenaline inversion by yohimbine. In spite of the presence of an adrenolytic, sparteine renders adrenaline hypertensive, but procaine does not oppose and sometimes accentuates adrenaline hypotension. Sparteine and procaine have very different actions in the latter instance.
ELVA G. SHIPLEY (Chem. Abstr.).

Effect of Tetraethyl Pyrophosphate on Sympathetic Ganglionic Activity. Koppanyi, Theodore, Karczmar, Alexander G., and King, Theodore O. (*Georgetown Univ., Washington, D.C.*). [*Science*, **106**, 492–3 (1947).]

The nicotinic (pressor) responses of various doses of acetylcholine were measured in atropinized dogs treated with tetraethyl pyrophosphate (I). The curve relating pressor response to dose of (I) peaked at 0·12 and 15 mgm./kgm. and dropped to 0 at about 70 mgm./kgm. The initial portions of similar curves for (I), hexaethyl pyrophosphate, diisopropyl fluorophosphate, and eserine have different slopes, making strict comparisons difficult; (I) is the most active anti-cholinesterase studied to date. CARL C. SMITH (Chem. Abstr.).

Results of Administration of Varying Doses of Sodium Bromide. Millikan, Clark H., Paul, William D. (*Univ. Hosps., Iowa City, Iowa*). [*J. Iowa State Med. Soc.*, **36**, 39–48 (1946); *cf. C. A.*, **39**, 4144[4].]

Varying doses of NaBr were given to 36 hospital patients over long periods of time. Eleven patients developed the syndrome of Br intoxication. The lowest blood Br level at which any patient developed Br intoxication was 195 mgm. per cent. Eight patients first showed evidence of intoxication with blood Br levels between 200 and 300 mgm. per cent. One patient exhibited toxic signs at a

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blood Br level of 319 mgm. per cent. A toxic delirium (bromide psychosis) was produced in 9 patients; 8 had blood Br levels between 200 and 300 mgm. per cent. at the time they became psychotic. This syndrome was not produced in any patient with a stable personality. In most patients where bromism occurred there was a marked difference in the blood Br level at which symptoms first appeared and the level at which the subject returned to normal. The fact that some patients do not clear mentally from the effects of bromides until a low blood level is reached may explain the unusually low NaBr levels quoted by some authors as being toxic amounts of the drug. A bromoderma appeared in 4 patients while taking the drug. None of the 36 patients showed any evidence of addiction or habituation to the drug. RUTH BERGGREN (Chem. Abstr.).

Effects of Drugs on Nerve Activity. Gilman, Alfred (Edgewood Arsenal, Md.). [Ann. N.Y. Acad. Sci., 47, Art. 4, 549–58 (1946).]

A short description of the pharmacological effects of Na fluoroacetate, which interferes with acetate metabolism and diisopropyl fluorophosphate which almost irreversibly inhibits cholinesterase. C. C. SMITH (Chem. Abstr.).

Sympatholytics and the Rigidity of Decerebration. Minz, B., and Veil, Catherine (Sorbonne, Paris). [Compt. rend. soc. biol., 141, 573–4 (1947); cf. C. A., 41, 807e, 5606d.]

Sympatholytic drugs of such diverse structures as yohimbine, corynanthine, and piperidinomethylbenzodioxan (F 933) temporarily relax the rigidity of decerebration in rabbits. The rigidity reappears upon elimination of the drug. As a hypothesis it is suggested that the central lesion provokes the liberation of an adrenaline-like agent which augments the formation of acetylcholine in the muscles involved. L. E. GILSON (Chem. Abstr.).

Effect of Acid and Alkali on the Excitation of Central Nervous System by Caffeine and Alcohol. Kaku, Bundan. [Nagoya Igakkai Zasshi, 59, 29–36 (1944).]

Excitation of central nervous system in mice elicited by subcutaneous injection of caffeine or EtOH, as determined by their tracks made on smoked paper flooring of an inverted glass jar into which the animals were placed, was found to be weakened by simultaneous injection of 1 per cent. lactic acid and strengthened by a similar injection of 0·1 N Na_2CO_3. J. G. YOSHIOKA (Chem. Abstr.).

Metabolic Action of the Cardiac Glycosides. I. Influence on Respiration of Heart Muscle and Brain Cortex. Wollenberger, Albert (Harvard Med. School, Boston). [J. Pharmacol. Exptl. Therap., 91, 39–51 (1947).]

Ouabain, 2–3 × 10^{-7} M, increases the O uptake of slices of guinea-pig heart muscle in the presence of glucose or lactate.; at higher concentrations this increase (maximally 50 per cent.) is followed by a depression (maximally 80 per cent.). Of various other guinea-pig tissues studied, only brain cortex responded in a similar manner, and the effect was only about 0·2 as great as with heart muscle. Oxidation of succinate in heart slices is not inhibited by ouabain; in brain it is slightly inhibited. In the presence of ouabain the O uptake of heart slices, which is high initially, is depressed by ouabain without preceding stimulation. The effect of ouabain on O uptake of brain cortex slices is the same with pyruvate as with glucose or lactate. The inhibition of the respiration of brain cortex slices by ouabain cannot be reversed by washing. Ouabain has no significant effect on respiratory activity of homogenized heart and brain and of isolated oxidative systems. This indicates that ouabain does not directly interfere with the catalytic function of respiratory enzymes and that its site of action is probably the cell surface. Its probable action *in vivo* is discussed from this viewpoint.
L. E. GILSON (Chem. Abstr.).

The Physiological Effects of Curare and its Use as an Adjunct to Anesthesia. Harroun, Phyllis, Beckert, Frederick E., and Fisher, Carl W. (Univ. of California Med. School, San Francisco). [Surg., Gynecol. Obstet., 84, 491–8 (1947).]

The physiological effects of 40 mgm. to 4 gm. of curare were studied in unanesthetized dogs. No deaths were attributed to the specific toxicity of curare.

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Apneic doses (56 or 88 mgm.) did not produce anesthesia or analgesia, but a rise in blood sugar averaging 49·9 mgm. per cent. and glycosuria occurred. Electrocardiographic tracings resembled those seen in K poisoning, and electroencephalograms showed cerebral dysrhythmia. Repeated administrations caused no change in the animal's reaction to the drug. Curare neither passes the placental barrier nor paralyzes the uterine musculature of the dog. After intravenous injection of the apneic dose (about 200 mgm.) of curare in man, there was an immediate transient fall in the blood pressure which returned to normal within 5 minutes, a blood sugar rise averaging 13 per cent., and a slight decrease in liver function. There were no significant changes in electrocardiograph tracings or in kidney function.

B. R. MURRAY (Chem. Abstr.).

Antagonism Between Curare and the Potassium Ion. Quilliam, J. P., and Taylor, D. B. (King's Coll., Univ. of London). [*Nature*, **160**, 603 (1947).]

At constant temperature from 25° to 40°, the antagonism, as measured by paralysis of the rat diaphragm, is linear. Three times more curare is required at 25° to antagonize the K ion normally present in tissue than at 40°. Conclusion: Voluntary muscle seeks positive charges and curare displaces the K ion.

I. M. KLOTZ (Chem. Abstr.).

A Chemical Method for the Determination of Streptomycin in Blood and Spinal Fluid. Boxer, George E., and Jelinek, Violk C. (Merck & Co., Inc. Rahway, N.J.). [*J. Biol. Chem.*, **170**, 491–500 (1947); *cf. C. A.*, **41**, 6594*e*.]

A method of analysis of streptomycin (I) was devised sensitive to 1 γ of (I) and based on the formation of a hydrazone with 9-*hydrazinoacridine hydrochloride* (prepared by refluxing 9-chloroacridine and $H_2NNH_2.H_2O$ in EtOH). After the removal of the excess reagent and hydrazones of acid, neutral, and weakly basic compounds by extraction with $C_6H_5CH_3$-OH-CCl_4 solution, the amount of hydrazone of (I) was determined fluorometrically. W. S. PORT (Chem. Abstr.).

New Investigations on the Anticonvulsant Action of Cocaine. Gutiérrez-Noriega, C., and Ortiz, V. Zapata (Facultad med., Lima). [*Rev. med. exptl. (Lima, Peru)*, **4**, 249–67 (1947); *cf. C. A.*, **41**, 2173*c*.]

Into rats which had received a lethal dose of strychnine subcutaneous injections of 10–70 mgm./kgm. cocaine-HCl (I) or phenobarbital (II) or both together were made. (I) inhibited the convulsions, reduced the intensity of the attack, and increased the latent period of convulsions and the time of survival. There was a close parallel between the percentage of suppressions of convulsions and the time of survival. The optimal action was observed with 40 mgm./kgm. of (I). (II) had less anticonvulsive effects but the percentage of survival, the period of convulsions and the period of survival increased progressively with the dose. The anticonvulsant and antilethal effect of (I) was antagonized by (II). Conclusion: (I) inhibits the convulsions by nervous excitation, (II) by depression of oxidation of the nervous tissue. F. FROMM (Chem. Abstr.).

Experimental Catalepsy Produced by Cocaine. Gutiérrez-Noriega, C., and Ortiz, V. Zapata (Inst. nacl. Hygiene, Lima). [*Rev. med. exptl. (Lima, Peru)*, **4**, 268–83 (1945).]

A dog which received 5 mgm. cocaine-HCl (I) per kgm. body weight on alternating days began to show cataleptic reactions 1 month after beginning of treatment. The reaction was proportional to the dose of (I) (up to 10 mgm. per kgm.) and was preceded and followed by motor excitation which was shorter with higher doses while the time of catalepsis increased. The hyperthermy caused by (I) was less in catalepsy but did not disappear completely. Catalepsy was not produced by (I) if 10–20 mgm. nembutal or phenobarbital per kgm. were injected; only motor unrest was observed in this case. Injection of 30 mgm. sodium caffeine benzoate previous to treatment with (I) intensified the catalepsy while injection of caffeine, metrazole, and nikethamide alone did not produce catalepsy. In the cataleptic state the blood glucose was slightly increased; inorganic P in the blood decreased. Alkaline phosphate, urea, alkaline reserve, and Ca in the blood showed no changes.

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Conclusion : Cocaine catalepsy is a more intense excitation of the nervous centers than that which produces motor unrest, but not so intense as that in cocaine convulsions. F. FROMM (Chem. Abstr.).

*The Toxicity and Narcotic Action of Bromochloromethane with Special Reference to Inorganic and Volatile Bromide in Blood, Urine and Brain. Svirbely, J. L., Highman, B., Alford, W. C., and Oettingen, W. F. v. (Natl. Inst. Health, Bethesda, Md.). [J. Ind. Hyg. Toxicol., **29**, 382–9 (1947).]*

In mice, the LD_{50} for CH_2ClBr is 2994 p.p.m., for CH_2-Cl_2, 16,186 p.p.m., and for CCl_4, 9526 p.p.m. Repeated exposure for 7 hours to 1000 p.p.m. of CH_2ClBr on 5 days per week for 14 weeks was tolerated by rats, rabbits, and dogs without evidence of toxic reaction. No significant changes were observed in the blood picture of dogs and rabbits. No evidence of liver damage was noted in the dogs. Repeated examination of the urine gave no evidence of kidney injury. Data are presented on the concentration at various times of inorganic bromide in serum, urine, and brain, and of organic bromide in blood and brain of the exposed and control animals. The histopathologic findings in these and other animals indicate that CH_2ClBr will cause temporary degenerative changes of the liver, but, in contrast to CCl_4, no cirrhosis of the liver was found under the conditions of these experiments. G. M. PETTY (Chem. Abstr.).

*A Theoretical Note Concerning the Action of Drugs on the Central Nervous System. Barany, E. H. (Univ. Uppsala, Sweden). [Arch. intern. pharmacodynamie, **75**, 222–6 (1947).]*

The action of drugs affecting synaptic transmission should be more marked in functional systems based on long chains of neurones than in short-chain systems. M. L. C. BERNHEIM (Chem. Abstr.).

*Action of some Curare-like Drugs of the Triethylcholine Phenolic Ether Series on the Superior Cervical Ganglion of the Cat. Depierre, France. [Compt. rend., **225**, 956–7 (1947).]*

In the chloralose-anaesthetized cat, the contraction of the nictitating membrane (following postganglionic electric stimulation) is not modified by $[C_6H_5OCH_2CH_2N(C_2H_5)_3I]$ (I); $[C_6H_4(OCH_2CH_2N(C_2H_5)_3I)_2]$ (II); or $[C_6H_3(OCH_2CH_2N(C_2H_5)_3I)_3]$ (III). However, following preganglionic stimulation, intravenous injection of 2 mgm./kgm. of (I) abolishes the contraction. (I) is as powerful in this respect as the tetraethylammonium ion (cf. Acheson and Pereira, *C. A.*, **40**, 6162[2]) but is not as long acting. For the same effect, 50 and more than 100 mgm./kgm. are needed in the case of (II) and (III) respectively. Hypotensive action parallels that on the sympathetic ganglion. The order of potency for curare-like action, however, is (III) > (II) > (I). Tubarine (from natural curare) has a curarization : paralysis potency ratio of 1 : 5, and (III) differs from tubarine in having a ratio of 1 : 100. CARTER D. JOHNSTON (Chem. Abstr.).

*Comparison of Dihydroergotamine, Ergotamine, and Other Agents in the Treatment of Migraine. Dannenberg, Thurman. [Permanente Foundation Med. Bull., **4**, 96–103 (1946).]*

In 15 cases of true migraine headache injected ergotamine tartrate gave the highest percentage relief followed with decreasing effectiveness by dihydroergotamine, O inhalation, oral ergotamine tartrate, and EtCl spray. Epinephrine and placebos were ineffective. KARL F. URBACH (Chem. Abstr.).

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The following names are printed in SMALL CAPITALS: authors of original articles and of books reviewed. Names of authorities referred to in the text are in ordinary type.

(R.) indicates a *Review*; the title of the book reviewed is followed by the author's name, thus: "Psycho-analysis and its Derivatives, by H. Crichton-Miller (R.)."

(E.) indicates the *Epitome* section; the title of the abstract is followed by the author's name, thus: "Age and human ability. Miles, W. R. (E.)."

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